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SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Andrew Wessman Examiner # : 78959 Date: 3/8/02
Art Unit: 1742 Phone Number 305-3163 Serial Number: 09/705101
Mail Box and Bldg/Room Location: CP3 7B26 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Physical Vapor Deposition Targets and methods of fabricating metallic materials

Inventors (please provide full names): V. M. Segal, S. Ferrasse, F. Alford

Earliest Priority Filing Date: 11/02/00

***For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.**

Physical vapor deposition target or sputtering target with <220> or <110> crystallographic texture.

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Online Time: 60	Patent Family	WWW/Internet
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PTO-1590 (1-2000)

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     FILE 'HCA' ENTERED AT 16:35:12 ON 12 MAR 2002
L1          7647 SEA (PHYS# OR PHYSICAL?)(3A)(VAPOR? OR VAPOUR?)(3A)DEPOSI
                 T? OR PVD OR P(W)V(W)D
L2         99213 SEA SPUTTER?
L3         96396 SEA 220
L4        215830 SEA 110
L5         31056 SEA FCC OR F(W)C(W)C OR FACE#(2A)CENTER?(2A)(CUBE# OR
                 CUBIC? OR CUBOID?) OR FACECENTER?(2A)(CUBE# OR CUBIC? OR
                 CUBOID?)
L6        271665 SEA TARGET?
L7            46 SEA L1 AND L3
L8             1 SEA L7 AND L6
L9       1119940 SEA TARGET? OR STRIKE# OR STRIKING# OR STRUCK? OR HIT OR
                 HITS OR HITTED OR HITTING# OR IMPING? OR IMPART? OR
                 COLLID? OR COLLISION? OR COLLECT? OR BOMBARD? OR IMPACT?
                 OR GUN OR GUNS OR GUNNING# OR GUNNER?
L10            4 SEA L7 AND L9
L11            1 SEA L7 AND L5
L12          411 SEA L2 AND L3
L13          121 SEA L12 AND L9
L14           92 SEA L12 AND L6
L15            5 SEA L13 AND L5
L16           11 SEA L12 AND L5
L17            4 SEA L14 AND L5
L18           74 SEA L1 AND L4
L19            6 SEA L18 AND L5
L20           19 SEA L18 AND L9
L21         2014 SEA L2 AND L4
L22          100 SEA L21 AND L5
L23          676 SEA L21 AND L9
L24           38 SEA L22 AND L23
L25           22 SEA L24 AND L6

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                 OR GRIT? OR GRAIN# OR GRANUL? OR POWDER? OR SOOT? OR
                 SMUT? OR FINES# OR PRILL? OR FLAKE# OR PELLET? OR
                 BB#)/BI,AB
L27          733 SEA (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR DUST?
                 OR GRIT? OR GRAIN# OR GRANUL? OR POWDER? OR BB#)(2A)(SIZE
                 # OR SIZING#) OR GRAINSIZE# OR GRAINSIZING#
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     FILE 'HCA' ENTERED AT 16:56:49 ON 12 MAR 2002
L28         276054 SEA (PARTICL? OR MICROPARTICL? OR PARTICULAT? OR DUST?
                   OR GRIT? OR GRAIN# OR GRANUL? OR POWDER? OR BB#)(2A)(SIZE
                   # OR SIZING#) OR GRAINSIZE# OR GRAINSIZING#
L29              3 SEA L7 AND L28
L30             34 SEA L12 AND L28
L31              4 SEA L18 AND L28
L32             94 SEA L21 AND L28
L33              3 SEA L30 AND L32
L34          76952 SEA TEXTUR?
L35              8 SEA L30 AND L34
L36             22 SEA L32 AND L34
L37             11 SEA L7 AND L34
L38             48 SEA L12 AND L34
L39             17 SEA L18 AND L34
L40            225 SEA L21 AND L34
L41              3 SEA L38 AND L40
L42             32 SEA L8 OR L10 OR L11 OR L15 OR L17 OR L19 OR L29 OR L31
                   OR L33 OR L35 OR L41
L43             27 SEA (L16 OR L37 OR L39) NOT L42
L44              8 SEA L20 NOT (L42 OR L43)
L45             42 SEA (L25 OR L36) NOT (L42 OR L43 OR L44)

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L42 ANSWER 1 OF 32 HCA COPYRIGHT 2002 ACS

136:140340 Surface morphology of C60 polycrystalline films from **physical vapor deposition**. Chen, Reui-San; Lin, Yi-Jie; Su, Yu-Ching; Chiu, Kuan-Cheng (Department of Physics, Chung Yuan Christian University, Chung-Li, 32023, Taiwan). Thin Solid Films, 396(1,2), 103-108 (English) 2001. CODEN: THSFAP. ISSN: 0040-6090. Publisher: Elsevier Science S.A..

AB C60 polycryst. films grown from **phys. vapor deposition** were obtained. A surface morphol. diagram in terms of the degree of supersatn. and the relative strength of bonding energy vs. thermal energy is detd. from SEM, and discussed. The **size** of the **grains** in the high quality polycryst. films depends sensitively on supersatn. and substrate temp. X-ray diffraction is applied, and the preferential

orientations of these grains are in the (111), (**220**) and (311) directions.

CC 66-3 (Surface Chemistry and Colloids)
Section cross-reference(s): 75

IT Crystal orientation
(of C60 grains in polycryst. films from **phys**. **vapor deposition**)

IT Crystallization
(of C60 polycryst. films from **phys**. **vapor deposition**)

IT **Vapor deposition** process
(**phys**.; surface morphol. of C60 polycryst. films from **phys**. **vapor deposition**)

IT Surface structure
(surface morphol. of C60 polycryst. films from **phys**. **vapor deposition**)

IT 99685-96-8, C60 Fullerene
(surface morphol. of C60 polycryst. films from **phys**. **vapor deposition**)

L42 ANSWER 2 OF 32 HCA COPYRIGHT 2002 ACS

136:140306 Preferential resputtering phenomenon on the surface of (100)-oriented Ni-Pt films: Effect of substrate bias during **sputter** deposition. Shi, J.; Zhou, R.; Hashimoto, M. (Department of Applied Physics and Chemistry, The University of Electro-Communications, Chofugaoka, Chofu-shi, Tokyo, 182-8585, Japan). Journal of Vacuum Science & Technology, A: Vacuum, Surfaces, and Films, 19(6), 2979-2981 (English) 2001. CODEN: JVTAD6. ISSN: 0734-2101. Publisher: American Institute of Physics.

AB Effects of substrate bias during **sputter** deposition on the structure and compn. of Ni-Pt/MgO(100) films were investigated. Ni-Pt films deposited at **220**.degree.C are composed of a Ni-Pt substitutional solid soln. of **face-centered cubic** structure. All the films are single cryst. with identical crystallog. orientation with the substrate, regardless of the substrate bias. However, the compn. of the films was significantly affected by the substrate bias: Pt content increased with increasing the substrate bias within the investigated range. This phenomenon is explained in terms of the preferential resputtering of Ni by **impinging** ions and neutrals generated by the substrate bias. Furthermore, the crystallinity of the films was also affected by the substrate bias.

CC 66-3 (Surface Chemistry and Colloids)
Section cross-reference(s): 56, 77

ST **sputtering** nickel platinum film substrate bias surface compn

IT Bias potential
Coercive force (magnetic)
Crystallinity
Magnetization
Sputtering
Surface composition

(preferential resputtering phenomenon on the surface of (100)-oriented Ni-Pt films and effect of substrate bias during **sputter** deposition)
IT 12623-53-9
(preferential resputtering phenomenon on the surface of (100)-oriented Ni-Pt films and effect of substrate bias during **sputter** deposition)
IT 1309-48-4, Magnesia, processes
(substrate; preferential resputtering phenomenon on the surface of (100)-oriented Ni-Pt films and effect of substrate bias during **sputter** deposition)

L42 ANSWER 3 OF 32 HCA COPYRIGHT 2002 ACS
135:265432 Role of process parameters in the texture evolution of TiN films deposited by hollow cathode discharge ion plating. Chen, Y. M.; Yu, G. P.; Huang, J. H. (Department of Engineering and System Science, National Tsin Hua University, Hsinchu, 300, Taiwan). Surf. Coat. Technol., 141(2-3), 156-163 (English) 2001. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..
AB TiN coatings **deposited** by various **phys**. **vapor deposition** (**PVD**) processes often exhibit certain preferred orientations, which are heavily affected by process parameters. This study thoroughly examines the preferred orientation of TiN film deposited by a hollow cathode discharge (HCD) ion plating system. The roles of process parameters in detg. the preferred orientation of TiN films were studied. Process parameters such as bias voltage, deposition power and N pressure all affect the degree of ion **bombardment** during deposition. The strain accumulation or lattice damage in TiN film caused by ion **bombardment** dets. the preferred TiN texture to be (111) or (**220**). These two phenomena, strain accumulation and lattice damage under ion **bombardment**, are more obvious at a low deposition temp. Without ion **bombardment**, high temps. mainly increase the energy of adatoms, enabling the thermodynamically favorable orientation (200) to be achieved.
CC 76-12 (Electric Phenomena)
IT Bias potential
Crystal orientation
Ion **bombardment**
Reactive sputtering
Strain
(role of process parameters in texture evolution of titanium nitride films deposited by hollow cathode discharge ion plating)

L42 ANSWER 4 OF 32 HCA COPYRIGHT 2002 ACS
135:249669 **Physical vapour deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates. Westmacott, K. H.; Hinderberger, S.; Dahmen, U. (National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, Berkeley, CA, 94720, USA). Philos. Mag. A, 81(6), 1547-1578 (English) 2001. CODEN: PMAADG. ISSN: 0141-8610. Publisher: Taylor

& Francis Ltd..

AB Epitaxial **fcc**., bcc. and hcp. metal and alloy films were grown in high vacuum by **phys. vapor deposition** at high rate (flash deposition) on the (111), (**110**) and (100) surfaces of Si and Ge at different deposition temps. The resulting epitaxial relations and morphol. features of these films were characterized by TEM and diffraction. Simple epitaxial relations were found mainly for the **fcc**. metals that form binary eutectic systems with Si and Ge. Of these, Ag exhibited exceptional behavior by forming in a single crystal cube-cube relation on all six semiconductor surfaces. Al and Au both formed bicrystal films on (100) substrates but differed in their behaviors on (111) substrates. Silicide formers such as the **fcc**. metals Cu and Ni, as well as all bcc. and hcp. metals studied, did not adopt epitaxial relations on most semiconductor substrates. However, epitaxial single-crystal, bicrystal and tricrystal films of several metals and alloys could be grown by using a Ag buffer layer. The factors controlling the epitaxial growth of metal films are discussed in the light of the observations and compared with the predictions of established models for epitaxial relations. Epitaxial films can be grown easily if the film forms a simple eutectic or monotectic system with the substrate. The epitaxial relations of those films depend on crystallog. factors for metal-metal epitaxy and on the substrate surface structure for metal-semiconductor epitaxy.

CC 75-2 (Crystallography and Liquid Crystals)
Section cross-reference(s): 55, 56

ST **phys vapor deposition** epitaxial thin metal film; metal epitaxial film growth silicon germanium substrate

IT Crystal morphology
Epitaxial films
Microstructure
Texture (metallographic)
Transmission electron microscopy
(**phys. vapor deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates)

IT Metals, properties
(**phys. vapor deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates)

IT **Vapor deposition** process
(**phys.; phys. vapor deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates)

IT 7440-21-3, Silicon, processes 7440-56-4, Germanium, processes
(**phys. vapor deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates)

IT 7429-90-5, Aluminum, properties 7439-89-6, Iron, properties
7439-95-4, Magnesium, properties 7440-02-0, Nickel, properties

7440-22-4, Silver, properties 7440-32-6, Titanium, properties
7440-47-3, Chromium, properties 7440-48-4, Cobalt, properties
7440-50-8, Copper, properties 7440-57-5, Gold, properties
7440-62-2, Vanadium, properties 7440-66-6, Zinc, properties
11100-87-1 12629-90-2 360067-91-0
(**phys**. **vapor deposition** growth and transmission electron microscopy characterization of epitaxial thin metal films on single-crystal Si and Ge substrates)

L42 ANSWER 5 OF 32 HCA COPYRIGHT 2002 ACS
134:330426 Chromium nitride coating. Hurkmans, Antonius P. A.; Van der Kolk, Gerrit-Jan; Lewis, David Brian; Muenz, Wolf-Dieter (Hauzer Techno Coating Europe B.V., Neth.). Ger. Offen. DE 19952549 A1 20010503, 2 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1999-19952549 19991102.
AB A substrate is coated with chromium nitride layer with a Vickers hardness of 2,700-3,500 having a **fcc**. lattice with preferred orientation at {200} direction, and other orientations at {111}, {311}, and {**220**} with falling peak intensity (Bragg-Bretano Cu-K.alpha.). Peak width of {200}-signal 2.theta. is > 2.degree. by (FWHM) Full Width Half Method, and the lattice parameter of {200}-line is > 4.2 .ANG.. The chromium nitride coating is manufd. by (**PVD**) **phys**. **vapor deposition** process esp. cathodic sputtering, cathodic arc discharge evapn., or ion plating. Y, Sc, and/or La at 0.01-10 at.%, preferably 3-5 at.% can be added in the chromium nitride coating in layers with a periodicity of 2-5 nm. The mean **grain size** of CrN, CrYN, CrScN, CrLaN is < 35 nm.
IC ICM C23C030-00
ICS C23C014-22
CC 57-2 (Ceramics)
IT **Vapor deposition** process
(**phys**.; chromium nitride coating)

L42 ANSWER 6 OF 32 HCA COPYRIGHT 2002 ACS
133:255507 Molecular dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc** metals. Palacios, F. J.; Iniguez, M. P.; Lopez, M. J.; Alonso, J. A. (Facultad de Ciencias, Departamento de Fisica Teorica, Universidad de Valladolid, Valladolid, 47011, Spain). Comput. Mater. Sci., 17(2-4), 515-519 (English) 2000. CODEN: CMMSEM. ISSN: 0927-0256. Publisher: Elsevier Science B.V..
AB Mol. dynamics simulations of the impact deposition of metal clusters on **fcc**. metal surfaces are presented. Two-dimensional elongated islands are formed when the incident cluster travels parallel to the surface. For perpendicular incidence the results of the impact event are very sensitive to the relative cohesive properties of the cluster and substrate atoms.
CC 56-6 (Nonferrous Metals and Alloys)
IT Clusters
(mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)

IT Simulation and Modeling, physicochemical
(mol. dynamics; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)
IT **Vapor deposition** process
(**phys**.; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)
IT Metals, processes
(substrate; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)
IT 7440-57-5, Gold, processes
(cluster; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)
IT 7429-90-5, Aluminum, processes
(clusters; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)
IT 7440-02-0, Nickel, processes 7440-50-8, Copper, processes
(substrate; mol. dynamics study of cluster impact on the (001) and (**110**) surfaces of **fcc**. metals)

L42 ANSWER 7 OF 32 HCA COPYRIGHT 2002 ACS
133:215736 **Sputtering target** of metal or alloy having **face centered cubic** structure.
Seki, Takakazu; Nakamura, Yuichiro (Japan Energy Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2000239835 A2 20000905, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1999-42616 19990222.
AB The **target** uses the title metal or alloy satisfying ((111)+(200))/(**220**) plane orientation ratio .gtoreq.2.20. The **sputtering** rate is high and a film can be formed in a short time by the adjustment of the plane orientation.
IC ICM C23C014-34
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56
ST **sputtering target fcc** metal alloy orientation
IT Alloys, properties
Metals, properties
(**fcc**.; **sputtering target** of **fcc**. structure metal or alloy having controlled plane orientation for high **sputtering** rate)
IT Crystal orientation
Sputtering targets
(**sputtering target** of **fcc**. structure metal or alloy having controlled plane orientation for high **sputtering** rate)
IT Silver alloy, base
(**target**; **sputtering target** of **fcc**. structure metal or alloy having controlled plane orientation for high **sputtering** rate)
IT 7429-90-5, Aluminum, properties 7440-02-0, Nickel, properties 7440-22-4, Silver, properties 7440-50-8, Copper, properties
(**target**; **sputtering target** of **fcc**. structure metal or alloy having controlled plane

orientation for high **sputtering** rate)

L42 ANSWER 8 OF 32 HCA COPYRIGHT 2002 ACS
132:225613 Mechanical properties of K18/Mo nano-laminar materials and their high temperature stability. Jin, Xuesong; Bi, Xiaofang; Ou, Shengquan; Gong, Shengkai; Xu, Huibin (Department of Materials Science and Engineering, Beijing University of Aeronautics and Astronautics, Beijing, 100083, Peop. Rep. China). Jinshu Xuebao, 36(1), 99-103 (Chinese) 2000. CODEN: CHSPA4. ISSN: 0412-1961. Publisher: Kexue Chubanshe.
AB K18/Mo nano-scale laminar materials have been prepd. by the means of EB-**PVD**, which have layer spacings of about 50, 70, **110** and 130 nm, resp., and the change of their strengths with bilayer thickness followed the Hall-Petch relation. The microstructure observations showed that the growth of **grain size** may be controlled by adjusting the layer spacing of nano-scale laminar materials. The mech. properties of K18/Mo nano-laminar materials at room temp., after appropriate heat-treatments, have been greatly improved, for example, the strength and strain are over 1000 MPa and 8%, resp.
CC 56-4 (Nonferrous Metals and Alloys)
IT **Grain size**
(strength in relation to; mech. properties of K18/Mo nanolaminate bilayers and high temp. stability)

L42 ANSWER 9 OF 32 HCA COPYRIGHT 2002 ACS
132:188737 Effect of substrate temperature on NiO/Ni81Fe19 exchange coupling double-layered films. Qiu, Jin-Jun; Li, Zuo-Yi; Zheng, Yuan-Kai; Li, Zhen; Lin, Geng-Qi; Xiong, Rui; Hu, Zuo-Qi; Lu, Zhi-Hong (Dept. of Electronic Sci. & Tech., Huazhong University of Sci. & Tech., Wuhan, 430074, Peop. Rep. China). Wuji Cailiao Xuebao, 14(6), 933-938 (Chinese) 1999. CODEN: WCXUET. ISSN: 1000-324X. Publisher: Kexue Chubanshe.
AB NiO films, NiFe films and double-layered NiO/NiFe films were prepd. on glass substrates by radiofrequency magnetron **sputtering** . The temp. of substrates (TS) were varied from room temp. (TR) to 300.degree.. The Hc of NiFe films deposited at TR was 584A.cntdot.m-1, it became 184A.cntdot.m-1 while the TS increased to 260.degree. and the squareness of hysteresis loop became better. The HC and HEXEX of NiO (50 nm)/ NiFe (15 nm) deposited at TR were 4000A.cntdot.m-1 and 1600A.cntdot.m-1, resp. The HC decreased to 3120A.cntdot.-m-1 and HEX increased to 4640A.cntdot.m-1 while the TS was 260.degree.. The squareness of hysteresis loop also became better and the blocking temp. (TB) was 230.degree.. XRD anal. indicated that the NiO films deposited at TR presented (**220**) **texture** whereas the films deposited at 260.degree. showed (111) **texture**. The NiFe films deposited at TR and 260.degree. both presented (111) **texture**, but the crystal **particle size** of the latter was larger.
CC 77-8 (Magnetic Phenomena)
IT Antiferromagnetism
Exchange interaction

Magnetic hysteresis
Magnetic multilayers
Magnetron **sputtering**
Particle size
X-ray diffraction
(effect of substrate temp. on NiO/Ni81Fe19 exchange coupling double-layered films)

L42 ANSWER 10 OF 32 HCA COPYRIGHT 2002 ACS
132:126403 Structural analysis of Ti1-xSixNy nanocomposite films prepared by reactive magnetron **sputtering**. Vaz, F.; Rebouta, L.; Almeida, B.; Goudeau, P.; Pacaud, J.; Riviere, J. P.; Bessa e Sousa, J. (Campus de Azurem, Dept. Fisica, Universidade do Minho, Guimaraes, 4810, Port.). Surf. Coat. Technol., 120-121, 166-172 (English) 1999. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB In this paper, we report on the prepn. of thin films resulting from addns. of Si to TiN matrix, by r.f. reactive magnetron **sputtering**. Results of X-ray diffraction (XRD) in both .theta.-2.theta. and .alpha.-2.theta. scans showed that a mixt. of two phases is present, where the first is most likely fcc TiN. The higher lattice parameter of this phase, about 0.429 nm (0.424 nm for bulk TiN), could be explained by taking into account that a correction of the residual stress effect on peak positions might slightly decrease the value of the lattice parameter (around 1%). Regarding phase 2, and although the exact nature of its compn. is more difficult to evaluate, we believe that it is also a cubic lattice consisting of Ti-Si-N, where the Si could be occupying Ti positions within the TiN lattice. This would explain the low value of the lattice parameter, which by assuming a cubic structure would be 0.418 nm. Concerning **texture** evolution, phase 1 revealed some variations in preferential growth, which changed from .ltbbrac.111.rtbbrac. for low Si addns. to .ltbbrac.**220** .rtbbrac. at intermediate Si addns. and finally to a weak .ltbbrac.200.rtbbrac. **texture** for large Si addns. A small amorphous region of silicon nitride for large Si addns. was also obsd. Fourier anal. of XRD patterns showed a decrease in the **size** of **grains** for small Si addns. when compared to that of TiN. For higher Si contents, only small changes were obsd., although a decrease in **grain size** seems to be the main tendency. The grains are within the range of 4-6 nm. High-resoln. TEM on Ti0.63Si0.37N1.12 confirmed this nanocryst. nature of the grains, revealing **grains** with **sizes** of about 2-3 nm.

CC 57-2 (Ceramics)

ST silicon titanium nitride nanocomposite film reactive magnetron **sputtering** structure

IT Crystal structure
Grain size
Reactive **sputtering**
(structural anal. of TiN-Ti1-xSixNy nanocomposite films prepd. by reactive magnetron **sputtering**)

IT Nanocomposites
(titanium nitride-silicon titanium nitride films; structural anal. of TiN-Ti1-xSixNy nanocomposite films prepd. by reactive magnetron **sputtering**)
IT 25583-20-4P, Titanium nitride tin 121368-53-4P, Silicon titanium nitride 217311-08-5P, Silicon titanium nitride Si0.37Ti0.63N1.12
(films, nanocomposites; structural anal. of TiN-Ti1-xSixNy nanocomposite films prepd. by reactive magnetron **sputtering**)

L42 ANSWER 11 OF 32 HCA COPYRIGHT 2002 ACS
132:115346 **PVD** growth of **fcc** metal films on single crystal Si and Ge substrates. Westmacott, K. H.; Hinderberger, S.; Radetic, T.; Dahmen, U. (Lawrence Berkeley National Laboratory, National Center for Electron Microscopy, Berkeley, CA, 94720, USA). Mater. Res. Soc. Symp. Proc., 562(Polycrystalline Metal and Magnetic Thin Films), 93-102 (English) 1999. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
AB Epitaxial films of the **fcc**. metals Al, Au, Ag and Ni were grown by **phys. vapor deposition** on Si and Ge (111), (**110**) and (100) substrates at different deposition temps. The epitaxial relations and morphol. features of these films were characterized by TEM and diffraction in plan view and cross section. Ag formed single crystal films on all substrates at all temps. Au and Al could be grown as bicrystals, and under some conditions, Al and Ni grew as tricrystal films. The morphol. effects of diffusion at the metal/substrate interface are ascribed to diffusion induced grain boundary migration.
CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56
ST **fcc** metal epitaxy germanium silicon
IT Grain boundaries
Point defects
Stacking faults
(in **fcc**. metal epitaxial films on single crystal Si and Ge substrates grown by **phys. vapor deposition**)
IT Diffusion
(interdiffusion; of **fcc**. metal films on single crystal Si and Ge substrates during annealing)
IT Vapor phase epitaxy
(of **fcc**. metal films on single crystal Si and Ge substrates)
IT 7429-90-5, Aluminum, properties 7440-02-0, Nickel, properties 7440-22-4, Silver, properties 7440-57-5, Gold, properties
(epitaxy of **fcc**. metal films by **phys. vapor deposition** on single crystal Si and Ge substrates and characterization)

L42 ANSWER 12 OF 32 HCA COPYRIGHT 2002 ACS
132:86084 **PVD** growth of **fcc**. metal films on single crystal Si and Ge substrates. Westmacott, K. H.; Hinderberger, S.;

Radetic, T.; Dahmen, U. (National Center for Electron Microscopy, Lawrence Berkeley National Laboratory, Berkeley, CA, 94720, USA). Mater. Res. Soc. Symp. Proc., 577(Advanced Hard and Soft Magnetic Materials), 583-592 (English) 1999. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB Epitaxial films of the **fcc**. metals Al, Au, Ag and Ni were grown by **phys. vapor deposition** on Si and Ge (111), (**110**) and (100) substrates at different deposition temps. The epitaxial relations and morphol. features of these films were characterized by TEM and diffraction in plan view and cross section. Ag formed single crystal films on all substrates at all temps. Au and Al could be grown as bicrystals, and under some conditions, Al and Ni grew as tricrystal films. The morphol. effects of diffusion at the metal/substrate interface are ascribed to diffusion induced grain boundary migration.

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56

ST **fcc** metal epitaxy germanium silicon substrate

IT Grain boundaries
(interdiffusion and grain boundary migration in annealing of **fcc**. metal films on Ge and Si substrates)

IT Diffusion
(interdiffusion; interdiffusion and grain boundary migration in annealing of **fcc**. metal films on Ge and Si substrates)

IT Vapor phase epitaxy
(of **fcc**. metal films on Si and Ge (111), (**110**) and (100) substrates at various temps.)

IT 7429-90-5, Aluminum, properties 7440-02-0, Nickel, properties 7440-22-4, Silver, properties 7440-57-5, Gold, properties
(epitaxy by **phys. vapor deposition** on Si and Ge (111), (**110**) and (100) substrates at various temps. and characterization)

L42 ANSWER 13 OF 32 HCA COPYRIGHT 2002 ACS

130:55159 Physical, structural and mechanical characterization of Ti1-xSixNy films. Vaz, F.; Rebouta, L.; Ramos, S.; Da Silva, M. F.; Soares, J. C. (Dept. Fisica, Universidade do Minho, Guimaraes, 4810, Port.). Surf. Coat. Technol., 108-109(1-3), 236-240 (English) 1998. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB Within the frame of this work, Ti1-xSixNy hard coatings with 0.ltoreq.x.ltoreq.0.37 and thicknesses ranging from 1.2 to 3.5 .mu.m, were prepd. by r.f. reactive magnetron **sputtering** in an Ar/N2 gas mixt. X-ray diffraction and Fourier anal. of X-ray profiles were used to investigate the structure and **grain size**, and its correlation with hardness behavior, as a function of the Si content, bias voltage and working gas (argon) flow rate. In this respect, the results show that a double cubic phase of NaCl type was developed with lattice parameters of 4.18 and 4.30 .ANG., revealing the (111) orientation for low Si content (x=0.05), (**220**) for intermediate Si contents (0.13.ltoreq.x.ltoreq.0.22), and (200) for the highest Si contents (0.30.ltoreq.x.ltoreq.0.37). Regarding the results of

ultramicrohardness tests, and although all samples with
0.05.ltoreq.x.ltoreq.0.30 present a hardness value higher than 30
GPa, the Ti0.85Si0.15N1.03 revealed the highest hardness value,
around 47 GPa, which is more than twice as high as that of common
TiN. Furthermore, the study of hardness as a function of the
applied bias voltage revealed that best results are achieved between
-50 and 0 V. The variation in hardness as a function of the argon
flow showed that best results in hardness are obtained when working
with flow rates around **110** cm3/min.
CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57
ST titanium silicon nitride film **sputtering** microhardness;
steel nitride film mech property
IT Abrasion-resistant coatings
Microhardness
Sputter deposition
Young's modulus
(phys., structural, and mech. characterization of Ti1-xSixNy
films **sputter**-deposited on steel)
IT 25583-20-4, Titanium nitride TiN 217311-00-7, Titanium nitride
silicide (Ti0.95N1.02Si0.05) 217311-01-8, Silicon titanium nitride
(Si0.12Ti0.88N1.04) 217311-03-0, Silicon titanium nitride
(Si0.17Ti0.83N1.06) 217311-04-1, Silicon titanium nitride
(Si0.22Ti0.78N1.07) 217311-06-3, Silicon titanium nitride
(Si0.3Ti0.7N1.1) 217311-08-5, Silicon titanium nitride
(Si0.37Ti0.63N1.12)
(coatings; phys., structural, and mech. characterization of
Ti1-xSixNy films **sputter**-deposited on steel)
IT 12725-23-4, Aisi M2
(phys., structural, and mech. characterization of Ti1-xSixNy
films **sputter**-deposited on steel)
IT 217311-02-9, Titanium nitride silicide (Ti0.85N1.03Si0.15)
(phys., structural, and mech. characterization of Ti1-xSixNy
films **sputter**-deposited on steel)

L42 ANSWER 14 OF 32 HCA COPYRIGHT 2002 ACS
129:348468 Field emitter fabrication using open circuit electrochemical
lift off. Porter, John D.; Chakarova, Gabriela S.; Knall, N. Johan;
Spindt, Christopher J. (Candescent Technologies Corp., USA). PCT
Int. Appl. WO 9849376 A1 19981105, 28 pp. DESIGNATED STATES: W:
JP, KR; RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC,
NL, PT, SE. (English). CODEN: PIXXD2. APPLICATION: WO 1998-US2525
19980210. PRIORITY: US 1997-848338 19970430.
AB A method for forming a field emitter structure in which a cavity
(208) is formed into an insulating layer (206) overlaying a first
elec. conductive layer (202). A second elec. conductive layer (210)
with an opening (212) is formed above the cavity. Electron emissive
material (214) is deposited directly onto the second elec.
conductive layer without first depositing an underlying lift-off
layer. Electron emissive material covers the opening in the second
elec. conductive layer and forms an electron emissive element (216)
within the cavity. A first potential is **imparted** to the

electron emissive element. A second open circuit potential is **imparted** to the closure layer of electron emissive material. The field emitter structure is exposed to an electrochem. etchant (**220**) wherein the electrochem. etchant etches electron emissive material which is biased at open circuit potential. Electron emissive material is removed from above the second elec. conductive layer without etching the electron emissive element.

IC ICM C25D005-02
ICS C25D005-48; B23H003-00; H01J001-02; H01J001-62; B44C001-22

CC 72-8 (Electrochemistry)
Section cross-reference(s): 76

IT Electron beam vapor deposition
Physical vapor deposition
(in field emitters fabrication)

IT Electrically conductive films
(**phys. vapor deposition** in field emitter fabrication)

IT 7429-90-5, Aluminum, uses
(**phys. vapor deposition** in field emitter fabrication)

L42 ANSWER 15 OF 32 HCA COPYRIGHT 2002 ACS

129:125774 **FCC** metal having controlled crystal orientation and its production method for **sputtering target**.
Kamizaki, Toshihiro; Tanabe, Aya (Dowa Mining Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 10195610 A2 19980728 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-358172 19961227.

AB The metal with predominant orientation (**110**) satisfies the ratio of I(**220**)/I(111) .gtoreq.2.0 [I(111) and I(**220**) are integral intensities of (111) plane and (**220**) plane in x-ray diffraction, resp.]. The metal optionally has Cu matrix with purity .gtoreq.6N and av. crystal **grain size** .ltoreq.200 .mu.m. In the prodn. method, rolling axis is changed by .gtoreq.15.degree. per one pass to satisfy total pass difference .gtoreq.90.degree. to carry out cross-rolling at total draft .gtoreq.20%, and then stress relief annealing without recrystn. is carried out. **Target** material of the metal with the predominant orientation is also claimed. The metal improves **sputtering** rate and gives uniform film, and electromigration of the film is also improved.

IC ICM C22F001-08
ICS C22C009-00; C23C014-34; C22F001-00

CC 56-8 (Nonferrous Metals and Alloys)
Section cross-reference(s): 75

ST **FCC** metal crystal orientation **sputtering target**; copper **FCC** predominant orientation rolling annealing

IT Annealing
Rolling (metals)
(**FCC** metal having controlled crystal orientation and its prodn. by controlled rolling and annealing)

IT **Sputtering targets**

Texture (metallographic)
(**FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)
IT Metals, processes
(**fcc**.; **FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)
IT 7440-50-8, Copper, processes
(**FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)

L42 ANSWER 16 OF 32 HCA COPYRIGHT 2002 ACS
129:125773 **FCC** metal having controlled crystal orientation and its production method for **sputtering target**.
Kamizaki, Toshihiro; Tanabe, Ikuo (Dowa Mining Co., Ltd., Japan).
Jpn. Kokai Tokkyo Koho JP 10195611 A2 19980728 Heisei, 6 pp.
(Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-358174 19961227.
AB The metal with random orientation satisfies the ratios of I(200)/I(111) .ltoreq.2.3 and I(**220**)/I(111) .ltoreq.1.0 [I(111), I(200), and I(**220**) are integral intensities of (111), (200), and (**220**) planes in x-ray diffraction, resp.]. The metal optionally has Cu matrix with purity .gtoreq.6N and av. crystal **grain size** .ltoreq.200 .mu.m.. In the prodn. method of the metal, rolling axis is changed by .gtoreq.15.degree. per one pass to satisfy total pass difference .gtoreq.90.degree. to carry out cross-rolling at total draft .gtoreq.20%, and then complete annealing with recrystn. is carried out. The metal having Cu matrix is manufd. by the above cross-rolling process followed by heat treatment at 498-823 K for 60-7200 s. **Target** material of the metal with the random orientation is also claimed. The metal improves **sputtering** rate and gives uniform film, and electromigration of the film is also improved.
IC ICM C22F001-08
ICS C22C009-00; C23C014-34; C22F001-00
CC 56-8 (Nonferrous Metals and Alloys)
Section cross-reference(s): 75
ST **FCC** metal crystal orientation **sputtering target**; copper **FCC** random orientation rolling annealing
IT Annealing
Rolling (metals)
(**FCC** metal having controlled crystal orientation and its prodn. by controlled rolling and annealing)
IT **Sputtering targets**
Texture (metallographic)
(**FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)
IT Metals, processes
(**fcc**.; **FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)

IT 7440-50-8, Copper, processes
(**FCC** metal having controlled crystal orientation and its prodn. for **sputtering target**)

L42 ANSWER 17 OF 32 HCA COPYRIGHT 2002 ACS
128:207987 Industrial applications of CrN (**PVD**) coatings, deposited at high and low temperatures. Navinsek, B.; Panjan, P.; Milosev, I. (Jamova 39, Joef Stefan Institute, 1001, Ljubljana, Slovenia). Surf. Coat. Technol., 97(1-3), 182-191 (English) 1997. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB Industrial applications of CrN (**PVD**) coatings are entering an expanding but selective range of mass manufd. goods. They may be prepd. as single, low- and high-temp. CrN coatings and double TiN + CrN coatings. In this work, depositions of CrN at high temps. were performed by a low voltage thermionic arc in a BAI 730M app., while at low temps. (below 250 .degree.C), the plasma-beam sputtering process in a SPUTRON app. was used. We studied the following crit. parameters that influence the quality of the coatings and applied the performance tests used in industrial practice: adhesion and scratching coeff., microhardness, surface topog., oxidn. and corrosion resistance. The performance tests were made with the assistance of technicians as well as in 12 Slovenian factories. CrN coatings were deposited at 480 .degree.C for wear and corrosion protection in cold forming and cutting of copper in **collector** manufg., in forming of aluminum components in automotive prodn. and for surface improvement of molds (made of H11 steel) in Al-Si die casting under pressure. Deposition temps. of 180-**220** .degree.C, obtained in the SPUTRON app., were required to improve cold forming tools made of alloyed tool steels (e.g. D2 and D3). The lowest obtainable temp. of 140 .degree.C in the SPUTRON gave a CrN coating of high quality for practical use. These coatings were used to protect electrodeposited and electropolished nickel molds (models) in artificial teeth prodn. Double TiN + CrN coatings were used as a highly abrasive-resistant coating in the prodn. of rotors (in the electromotor industry), and in cold forming and forging in mass manufg. of screws. The results and performance tests were compared with the available data, mostly published on forming, milling, deep drawing of copper, nickel and titanium and their alloys, and on die casting of aluminum and Al-alloys.

CC 57-7 (Ceramics)
Section cross-reference(s): 55, 56, 63

L42 ANSWER 18 OF 32 HCA COPYRIGHT 2002 ACS
127:349647 Rotational epitaxy vs. missing row reconstruction: Au/Cu/Au(**110**). Hugenschmidt, M. B.; Ruff, M.; Hitzke, A.; Behm, R. J. (Abteilung Oberflachenchemie Katalyse, Universitat Ulm, Ulm, D-89069, Germany). Surf. Sci., 388(1-3), L1100-L1106 (English) 1997. CODEN: SUSCAS. ISSN: 0039-6028. Publisher: Elsevier.

AB From scanning tunneling microscopy and ion scattering spectroscopy, it is found that Cu deposition on Au(**110**)-(1.times.2) at 300 K leads to a sandwich structure with Cu atoms occupying sites in

the second layer and Au atoms on top. At around .theta.Cu = 1.3 ML a new, stable phase with s-shaped chains of Au atoms in the surface layer, slightly rotated with respect to [1.hivin.10], is formed. This phase can be considered as a case of rotational epitaxy on the strongly anisotropic **fcc**. (**110**) surface.
Energetic contributions responsible for its formation are discussed.

CC 56-8 (Nonferrous Metals and Alloys)

IT **Physical vapor deposition**
(evapn.; selection of rotational epitaxy vs. missing row reconstruction sandwich structure in deposition of Cu on Au)

L42 ANSWER 19 OF 32 HCA COPYRIGHT 2002 ACS

127:349572 The role of stress in the heteroepitaxy of Au on W(**110**). Hildner, M. L.; Johnson, K. E.; Wilson, R. J. (IBM Research Division, Almaden Research Center, San Jose, CA, 95120-6099, USA). Surf. Sci., 388(1-3), 110-120 (English) 1997. CODEN: SUSCAS. ISSN: 0039-6028. Publisher: Elsevier.

AB The role of stress in forming a variety of Au film structures on W(**110**) is examd. with scanning tunneling microscopy (STM). The structural manifestations are different from those previously obsd. with STM because this system involves both an **fcc** (111)/bcc(**110**) interface that has mixed (tensile and compressive) strain and the Au(111) surface which reconstructs through strain relaxation. Whereas sub-monolayer films already show isotropic strain relaxation through a combination of three uniaxial expanded structures, the complete monolayer is pseudomorphic. Strain relaxation then leads to a two-dimensional dislocation structure in the bilayer film and a non-bulk-like yet fully strain-relaxed trilayer film. Stress is reintroduced for subsequently thicker films; this leads to the growth of flat-topped three-dimensional crystallites, none of which are terminated by the fourth layer, and to the eventual formation of the uniaxially compressed surface reconstruction of Au(111).

CC 56-6 (Nonferrous Metals and Alloys)

IT **Physical vapor deposition**
(evapn.; role of stress in heteroepitaxy of Au on W(**110**))

IT Epitaxy
Stress (mechanical)
Structural relaxation
(role of stress in heteroepitaxy of Au on W(**110**))

IT 7440-33-7, Tungsten, processes 7440-57-5, Gold, processes
(role of stress in heteroepitaxy of Au on W(**110**))

L42 ANSWER 20 OF 32 HCA COPYRIGHT 2002 ACS

127:59465 Effects of crystal **texture** on exchange anisotropy in NiO spin valves. Lee, Sang-Suk; Hwang, Do-Guwn; Park, C. M.; Lee, K. A.; Rhee, J. R. (Phys. Dep., Sangji Univ., Wonju, 220-702, S. Korea). J. Appl. Phys., 81(8, Pt. 2B), 5298-5300 (English) 1997. CODEN: JAPIAU. ISSN: 0021-8979. Publisher: American Institute of Physics.

AB The effects of crystal **texture** on magnetoresistance,

exchange anisotropy field Hex and coercive field Hc in the NiO350 .ANG./NiFe50 .ANG./Cu20 .ANG./NiFe50 .ANG. spin valve films deposited on Corning glass, MgO(100), MgO(**110**), and MgO(111) by radiofrequency and d.c. magnetron **sputtering** techniques were studied. The Hex and Hc of the NiO350 .ANG./NiFe50 .ANG. bilayers grown on MgO(111) and Corning glass were almost the same 90-93 Oe and 56-60 Oe, resp. The Hex of the bilayer film on MgO(100) decreased to 68 Oe, however, the Hc of that increased to 114 Oe. The steplike magnetoresistance curve of the spin valve film on MgO(**110**) disappeared. The x-ray scan of the NiO film deposited on Corning glass shows weakly preferred crystal orientation of NiO(200), (111) and (**220**) **texture** , and the NiO films on the MgO single crystals were grown (100), (**110**), and (111) epitaxial **textures**. There is no clear trend of increasing Hex for films with greater (111) **texture**. The large Hc of the bilayer on MgO(100) is probably due to interface roughness.

CC 77-1 (Magnetic Phenomena)
Section cross-reference(s): 75

ST nickel oxide spin valve **texture** magnetism; magnetoresistance nickel oxide spin valve **texture**

IT Glass, uses
(Corning; effect of crystal **texture** on properties of NiO/Ni-Fe/Cu/Ni-Fe spin valves on Corning glass and MgO substrates)

IT Coercive force (magnetic)
Epitaxial films
Exchange interaction
Magnetic anisotropy
Magnetoresistance
Microstructure
(effect of crystal **texture** on properties of NiO/Ni-Fe/Cu/Ni-Fe spin valves on Corning glass and MgO substrates)

IT Magnetic multilayers
(spin valves; effect of crystal **texture** on properties of NiO/Ni-Fe/Cu/Ni-Fe spin valves on Corning glass and MgO substrates)

IT 1313-99-1, Nickel oxide (NiO), properties
(effect of crystal **texture** on properties of NiO/Ni-Fe/Cu/Ni-Fe spin valves on Corning glass and MgO substrates)

IT 1309-48-4, Magnesium oxide (MgO), uses 7440-50-8, Copper, uses 11148-32-6
(effect of crystal **texture** on properties of NiO/Ni-Fe/Cu/Ni-Fe spin valves on Corning glass and MgO substrates)

L42 ANSWER 21 OF 32 HCA

127:59453 Microstructural and magnetic studies of Mn-Al thin films. Kuo, P. C.; Yao, Y. D.; Huang, J. H.; Shen, S. C.; Jou, J. H. (Inst. Mateirals Sci. Eng., National Taiwan Univ., Taipei, 107, Taiwan).

J. Appl. Phys., 81(8, Pt. 2B), 5621-5623 (English) 1997. CODEN: JAPIAU. ISSN: 0021-8979. Publisher: American Institute of Physics.

AB Mn-Al thin films with high coercivity and high satn. magnetization were successfully fabricated by radiofrequency magnetron **sputtering** with properly controlled chem. compn., substrate temp., and annealing temp. A high coercivity of .apprx.3000 Oe and a satn. magnetization of .apprx.420 emu/cc were achieved. During annealing at 410.degree., the nonmagnetic .epsilon. phase with a **grain size** of roughly 100 nm transforms into a metastable ferromagnetic .tau. phase with a platelike **grain size** of roughly 300 nm. From the continuous measurement of the stress of the films in vacuum as a function of temp., the authors obsd. a compression stress during heating at <220 .degree., and a tension stress at >220.degree. during cooling. The structure phase transformation from .epsilon. to .tau. phases was related to the stress variation from compression to tension. The high coercivity can be explained by the high magnetocryst. anisotropy const. of the .tau. phase and the magnetoelastic energy arises from the residual stress of Mn-Al films after the shear transformation.

CC 77-1 (Magnetic Phenomena)
Section cross-reference(s): 56

ST magnetism microstructure **sputtered** aluminum manganese film; heat treatment aluminum manganese microstructure magnetism

IT Radio-frequency **sputtering**
(magnetron; properties of **sputtered** and heat-treated aluminum-manganese films)

IT Coercive force (magnetic)
(properties of **sputtered** and annealed aluminum-manganese films)

IT Annealing
Cooling
Crystallite size
Heat treatment
Magnetic anisotropy
Magnetization
Magnetoelasticity
Residual stress
Shear
Stress (mechanical)
Structural phase transition
Texture (metallographic)
(properties of **sputtered** and heat-treated aluminum-manganese films)

IT Magnetron **sputtering**
(radio-frequency; properties of **sputtered** and heat-treated aluminum-manganese films)

IT 12780-45-9, Aluminum 46, manganese 54 (atomic) 51967-35-2 60224-91-1, Aluminum 50, manganese 50 (atomic) 65886-33-1, Aluminum 70, manganese 30 (atomic) 85538-07-4, Aluminum 40, manganese 60 (atomic) 119847-05-1, Aluminum 30, manganese 70 (atomic) 122737-74-0, Aluminum 60, manganese 40 (atomic)

132860-80-1, Aluminum 65, manganese 35 (atomic) 151750-56-0, Aluminum 52, manganese 48 (atomic) 191085-34-4, Aluminum 36, manganese 64 (atomic)
(properties of **sputtered** and heat-treated aluminum-manganese films)

L42 ANSWER 22 OF 32 HCA COPYRIGHT 2002 ACS
125:343266 Synthesis and mechanical properties of niobium films by ion beam assisted deposition. Ji, H.; Was, G. S.; Jones, J. W. (Univ. Michigan, Ann Arbor, MI, 48109, USA). Mater. Res. Soc. Symp. Proc., 434(Layered Materials for Structural Applications), 153-158 (English) 1996. CODEN: MRSPDH. ISSN: 0272-9172.

AB Mech. properties of Nb thin films were studied by controlling the microstructure, texture and residual stress of the films using ion beam assisted deposition (IBAD). Nb films were deposited onto (100) Si substrates and their microstructure, texture and residual stress were measured as a function of ion energy and R ratio (ion to atom arrival rate ratio). The **grain sizes** of these films ranged from 20 nm to 40 nm and no effect of ion bombardment was obsd. All the films have strong (**110**) fiber texture, but the in-plane texture is a strong function of the incident angle, energy and flux of the ion beam. While the degree of the texture increases with increasing ion energy and flux, it is also a strong linear function of the product of the two. The residual stress of the films was measured by a scanning-laser reflection technique. As a function of normalized energy, the stress is tensile for En < 30 eV/atom with a max. of 400 MPa at .apprx.15 eV/atom. It becomes compressive with increasing normalized energy and sats. at -400 MPa for En > 50 eV/atom. Both **PVD** (**phys. vapor deposition**) and IBAD films have a hardness of .apprx.6 GPa at shallow depth measured by nanoindentation. The different stress state may be responsible for the 15% difference on hardness obsd. between the **PVD** and IBAD films.

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 56, 76

L42 ANSWER 23 OF 32 HCA COPYRIGHT 2002 ACS
121:193818 Magnetic and crystallographic properties of Co-Cr-(Ta,Pt)/Cr films deposited by excimer laser ablation. Ishikawa, A.; Tanahashi, K.; Yahisa, Y.; Hosoe, Y.; Shiroishi, Y. (Cent. Res. Lab., Hitachi Ltd., Kokubunji, 185, Japan). J. Appl. Phys., 75(10, Pt. 2A), 5978-80 (English) 1994. CODEN: JAPIAU. ISSN: 0021-8979.

AB The crystal structure and magnetic properties of Co-alloy films deposited by KrF excimer laser ablation were investigated. A pulsed laser beam with wavelength of 248 nm was focused onto the deposition **targets** which were fixed in the vacuum chamber. Cr underlayer and Co-alloy films were successively deposited at a rate of 0.012 nm/pulse. The film surface was microscopically smooth compared to the **sputtered** films. This may be due to the low shadowing effect during the laser deposition. The compn. of the film was reproducibly controlled, though there was a slight difference between the compn. of film and **targ t** material.

The coercivities of Co-Cr-Pt/Cr films formed on the Si and Ni-P substrates at 250 .degree.C were 130 and **220** Oe, which were about one-fifth of the coercivity of **sputtered** films. Crystallog. analyses showed that Cr underlayer had no crystal orientation, and Co-alloy film consisted of fine **fcc**-type crystal grains. Low coercivity of the laser-deposited film is probably due to the lack of hcp Co phase.

CC 77-1 (Magnetic Phenomena)
Section cross-reference(s): 5

L42 ANSWER 24 OF 32 HCA COPYRIGHT 2002 ACS
121:137258 Nature of super-lubricating MoS2 **physical vapor deposition** coatings. Le Mogne, T.; Donnet, C.; Martin, J. M.; Tonck, A.; Millard-Pinard, N.; Fayeulle, S.; Moncoffre, N. (Lab. Tribiologie Dynamique Systemes, Ecole Cent. Lyon, Ecully, F-69131, Fr.). J. Vac. Sci. Technol., A, 12(4, Pt. 2), 1998-2004 (English) 1994. CODEN: JVTAD6. ISSN: 0734-2101.

AB MoS2 coatings with a super-low friction behavior (friction coeff. .apprx.0.001) have been recently synthesized in an ultra-high vacuum tribometer equipped with a rf magnetron sputtering device. Physicochem. and structural characterizations of the thin films have been carried out using XPS and AES (Auger electron spectroscopy) to det. the extreme surface compn., HRTEM (high-resoln. transmission electron microscopy), GXRD (grazing-angle x-ray diffraction) for structural investigations, RBS (Rutherford backscattering spectrometry) for thickness and stoichiometry detn., and NBS (nuclear backscattering spectrometry) for quant. anal. of oxygen contamination. Indentation tests at nm scale have also been performed to compare the mech. consts. (Young modulus, hardness) of the sputtered MoS2 films with the characteristics of molybdenite and to confirm the overall data. The coatings are made of highly pure, stoichiometric MoS2, with a polycryst. microstructure (**grain size** on the order of 10 nm). The stoichiometry is MoS1.97.+-.0.10O0.10.+-.0.01. Most of the grains are "edge-oriented" on the substrate surface [relative to their (002) basal planes], with an azimuthal disorder of the other crystallog. directions [(100) and (**110**)]. Consequently, and by comparison with already published data, the super-low friction regime is found to be assocd. with the purity and microstructure of the coating.

CC 51-8 (Fossil Fuels, Derivatives, and Related Products)
ST molybdenum disulfide lubricant coating structure; **phys vapor deposition** lubricant coating
IT **Vapor deposition** processes
(**phys**., molybdenum disulfide lubricant coatings deposited with, properties and structure of)

L42 ANSWER 25 OF 32 HCA COPYRIGHT 2002 ACS
119:77690 **Texture** and microstructure of thin copper films. Sunnetcioglu, Maral; Knorr, D. B. (Cent. Integr. Electron., Rensselaer Polytech. Inst., Troy, NY, 12180-3590, USA). J. Electron. Mater., 22(6), 611-16 (English) 1993. CODEN: JECMA5.

ISSN: 0361-5235.
AB Pole figure x-ray diffraction and TEM electron microscopy were conducted on copper films deposited by **sputtering**, partially ionized beam deposition, chem. -vapor deposition, evapn., and electroplating. Quant. **texture** data were detd. from fiber **texture** plots. A typical copper film consists of three **texture** components (111), (200), and random. The (**220**) and (511) **texture** components are possible under some deposition conditions. Compared to aluminum films, the fraction of the random **texture** component and distribution of (hkl) components in copper films are relatively large. Bimodal **grain size** distributions are obsd. in some films.
CC 56-8 (Nonferrous Metals and Alloys)
ST copper film **texture** microstructure
IT **Texture**, metallographic
(of copper films, effect of deposition conditions on)
IT 7440-50-8, Copper, properties
(**texture** and microstructure of films of, effect of deposition conditions on)

L42 ANSWER 26 OF 32 HCA COPYRIGHT 2002 ACS
119:77592 The microstructure, mechanical stress, **texture**, and electromigration behavior of aluminum-palladium alloys. Rodbell, K. P.; Knorr, D. B.; Mis, J. D. (T. J. Watson Res. Cent., IBM Res. Div., Yorktown Heights, NY, 10598-0218, USA). J. Electron. Mater., 22(6), 597-606 (English) 1993. CODEN: JECMA5. ISSN: 0361-5235.
AB As the min. feature size of interconnect lines for elec. circuits decrease below 0.5 .mu.m, the need to control the line microstructure becomes increasingly important. The alloy, deposition process, fabrication method, and thermal history all det. the microstructure of an interconnect which, in turn, affects its performance and reliability. The microstructure of **sputtered** Al-0.3Pd, Al-2Cu-0.3Pd, and Al-0.3Nb-0.3 wt.% Pd alloy films vs. **sputtered** Al-0.5Cu and Al-2 wt.% Cu alloy films and to assess the role of **grain size**, mech. stress, and crystallog. **texture** on the electromigration behavior of submicrometer wide lines. The **grain size**, mech. stress, and **texture** of blanket films were measured as a function of annealing. The as-deposited film stress was tensile and followed a similar stress history on heating for all of the films. On cooling, however, significant differences were obsd. between the Al-Pd and Al-Cu films in the shape of their stress-temp. relations. A strong (111) crystallog. **texture** was typically found for Al-Cu films deposited on SiO2. A stronger (111) **texture** resulted when Al-Cu was deposited on 25 nm Ti. Al-0.3Pd films, however, exhibited either a weak (111) or (**220**) **texture** when deposited on SiO2, which reverted to a strong (111) **texture** when deposited on 25 nm Ti. The electromigration lifetimes of passivated, .apprx.0.7 .mu.m wide lines at 250.degree. and 2.5 .times. 106 A/cm2 for both single and multi-level specimens sepd. with W studs are reported. The electromigration behavior of

Al-0.3Pd was less dependent on film microstructure than on the annealing atm. used.
CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 76
ST aluminum palladium film microstructure property; **texture** aluminum palladium film property; electromigration aluminum palladium film; elec circuit aluminum palladium film
IT Electrodiffusion
Texture, metallographic
(of **sputtered** aluminum-palladium alloy films)
IT 130119-43-6 138817-56-8, Aluminum 100, palladium 0.3
146892-86-6, Aluminum 99, niobium 0.3, palladium 0.3
(**sputtered** films of, microstructure and **texture** and electromigration behavior of)

L42 ANSWER 27 OF 32 HCA COPYRIGHT 2002 ACS
116:245873 Relationship between magnetoresistance and lattice uncertainty at the interface in **sputtered** iron/chromium multilayer films. Takanashi, Koki; Obi, Yoshihisa; Mitani, Yuichiro; Fujimori, Hiroyasu (Inst. Mater. Res., Tohoku Univ., Sendai, 980, Japan). J. Phys. Soc. Jpn., 61(4), 1169-72 (English) 1992. CODEN: JUPSAU. ISSN: 0031-9015.
AB The relationship between the magnetoresistance and the paracryst. disorder of lattice plane spacings at the interface in Fe/Cr multilayer films prepd. by rf **sputtering**. The x-ray linewidths for the (**110**) and (**220**) peaks were analyzed using a modified paracryst. theory to obtain the **grain size** and the lattice uncertainity, which represents the degree of paracryst. disorder. The magnetoresistance increases with decreasing lattice uncertainity.
CC 76-1 (Electric Phenomena)
Section cross-reference(s): 66
IT Magnetoresistance
(of chromium/ironmultilayer **sputter**-deposited films, interface lattice disorder effect on)
IT 7439-89-6, Iron, properties
(magnetoresistance of **sputter**-deposited multilayer films of chromium and, interface paracryst. disorder effect on)
IT 7440-47-3, Chromium, properties
(magnetoresistance of **sputter**-deposited multilayer films of iron and, interface paracryst. disorder effect on)

L42 ANSWER 28 OF 32 HCA COPYRIGHT 2002 ACS
115:213280 Nucleation and concurrent anomalous grain growth of .alpha.-alumina during .gamma. .fwdarw. .alpha. phase transformation. Chou, Ting C.; Nieh, Tai G. (Res. Dev. Div., Lockheed Missiles and Space Co. Inc., Palo Alto, CA, 94304, USA). J. Am. Ceram. Soc., 74(9), 2270-9 (English) 1991. CODEN: JACTAW. ISSN: 0002-7820.
AB Nanocryst. Al2O3 thin films (50-nm thick) were prepd. by radio-frequency reactive **sputtering** deposition and subjected to annealing at 800-1200.degree.. TEM anal. indicated

that the as-deposited Al2O3 films contained both amorphous phase and metastable .gamma. phase. Structural **texture** evolved in the films annealed at 800.degree. for 24 h; the **texture** had a [001] preferred orientation and occurred along the {400} and {440} planes of .gamma.-Al2O3. In the films annealed at 1200.degree. for 2 h, nucleation and concurrent anomalous grain growth of .alpha.-Al2O3 took place in a fine-grained polycryst. .gamma.-Al2O3 matrix. The anomalously grown .alpha.-Al2O3 grains were primarily [0001]-oriented single crystals with **grain sizes** 3-15 .mu.m, while the .gamma.-Al2O3 matrix had an av. **grain size** of 50 nm. The .gamma.-Al2O3 matrix was also strongly **textured** along the [001] axis and exhibited a heavily faulted, layered microstructure. Most of these layers were oriented along the {**220**} crystallog. planes. Periodic superstructure was identified in the layered .gamma.-Al2O3. The formation of layered structure in .gamma.-Al2O3 is attributable to the change of stacking sequence of at. layers along the .ltbbrac. **220**.rtbbrac. orientations. An at. model is presented to explain the formation of layered structure in .gamma.-Al2O3. The nucleation of .alpha.-Al2O3 appears to occur along the {**220** } crystallog. planes of .gamma.-Al2O3. The explosive grain growth of .alpha.-Al2O3 during the .gamma. .fwdarw. .alpha. phase transformation is explained by a mechanism involving interface boundary migration and lattice epitaxy. The orientation relations between .gamma.- and .alpha.-Al2O3 are detd.

CC 57-2 (Ceramics)

L42 ANSWER 29 OF 32 HCA COPYRIGHT 2002 ACS

114:189775 The fine-scale microstructure of thin hard titanium nitride (TiN) and titanium carbide (TiC) coatings on steels. Knight, J. C.; Page, T. F. (Dep. Mech. Mater. Manuf. Eng., Univ. Newcastle upon Tyne, Newcastle upon Tyne, NE1 7RU, UK). Thin Solid Films, 193-194(1-2), 431-41 (English) 1990. CODEN: THSFAP. ISSN: 0040-6090.

AB X-ray diffraction and TEM were used to investigate the fine-scale microstructure of TiN and TiC obtained by chem.-vapor deposition and a range of proprietary TiN coatings 2-5 .mu.m thick obtained by **phys.-vapor deposition**. TEM involved both plan-view and edge-on specimens. While selected-area diffraction patterns in the TEM reflect local variability and some randomness in coating texture, integration over a larger specimen vol. by x-ray diffraction reveals {**220**} and {111} preferential orientations in the chem.- and **phys.-vapor deposited** specimens, resp. X-ray mapping indicated for some specimens trans-interfacial diffusion between Ti from the coatings and Cr from the substrate during coating deposition. TEM revealed considerable point-to-point variability in grain structure and **grain size** within a given specimen and from specimen to specimen with a high degree of in-grain defect (dislocation line and loop) contrast. The results are presented and discussed in terms of the microstructure effect on the subsurface deformation which controlls hardness, friction and

wear.
CC 55-6 (Ferrous Metals and Alloys)

L42 ANSWER 30 OF 32 HCA COPYRIGHT 2002 ACS
113:236276 Residual stress and strain distribution anomalies in titanium nitride films **deposited** by **physical vapor deposition**. Perry, A. J.; Jagner, M.; Sproul, W. D.; Rudnik, P. J. (GTE Valenite Corp., Troy, MI, 48084, USA). Surf. Coat. Technol., 42(1), 49-68 (English) 1990. CODEN: SCTEEJ. ISSN: 0257-8972.
AB The residual stress, lattice parameters and strain-broadening of diffraction peaks were studied in a series of TiN films deposited on a C3 cemented carbide substrate by reactive magnetron sputtering. The substrate bias voltage and the sputter **target** input power were varied. Complex residual stress situations could exist, e.g., (**220**) planes could exhibit high compressive and shear stress, (422) planes, simple low tensile stress, and (333)-(511) planes, simple low compressive stress conditions, within a given film. The obsd. residual stress behavioral patterns fell into 3 groups depending on the deposition conditions. In addn., the lattice parameters and peak broadening showed pos. or neg. deviations from the av. values of the remaining planes, specific within each behavioral pattern range. It is thought that these effects are assocd. with the dramatic increases in the defect and stacking fault population found with increasing bias and with the ultramicrocracking on (**220**) planes, which were reported in the literature from TEM studies of TiN films made by **phys.-vapor deposition** methods.
CC 57-2 (Ceramics)
Section cross-reference(s): 56
ST titanium nitride **phys vapor deposition** stress
IT 25583-20-4, Titanium nitride
(coatings, residual stress-strain distribution in, **phys.-vapor deposition** in relation to)

L42 ANSWER 31 OF 32 HCA COPYRIGHT 2002 ACS
96:73080 Structure and properties of chromium **deposited** by **physical vapor deposition**. Hahn, B. H.; Ahn, B. C. (Coll. Eng., Seoul Natl. Univ., Seoul, S. Korea). Taehan Kumsok Hakhoe Chi, 19(8), 618-23 (Korean) 1981. CODEN: TKHCDJ.
AB Cr films deposited on steel and glass substrates by electron beam evapn. were studied by SEM, x-ray diffraction, and microhardness. With increasing temp. from 25 to 850.degree., a porous and micro-domed structure of the deposits changed to the faceted and the macro-ledge structure above 300.degree., and to a smooth and grooved structure above 750.degree.. The [**110**] grain orientation at room temp. changed to [112]. The vol. fraction of [112] was max. and that of [**110**] was min. at .apprx.300.degree.. With increasing temp. from 300.degree., the [200] vol. fraction increased up to .apprx.720.degree., and grains were almost randomly oriented at higher temps. The relation between hardness and **grain**

size of films were explained by using the Hall-Petch equation.
CC 56-6 (Nonferrous Metals and Alloys)

L42 ANSWER 32 OF 32 HCA COPYRIGHT 2002 ACS
95:52827 X-ray determination of strain and **texture** in **sputtered** molybdenum and titanium films on silicon. Yesensky, R. J.; Rao, V.; Houska, C. R. (Def. Nucl. Agency, Washington, DC, 20305, USA). Thin Solid Films, 79(1), 27-38 (English) 1981. CODEN: THSFAP. ISSN: 0040-6090.
AB Mo and Ti films prepd. with a rotating radiofrequency diode system were examd. by x-ray diffraction for strain and **texture**. Both films were deposited onto (111)-oriented Si crystal substrates. Mo films 1.13 .mu.m thick **sputtered** with a target voltage of -2.7 kV, a zero substrate bias, and an av. temp. of 180.degree. were in compression on cooling to room temp. Pole d. plots for the (200), (211), (**220**), (222), (301), and (321) planes gave relatively sharp peaks. The (**220**) plane showed a strong peak parallel to the (111) plane on Si. In contrast, a 1.25 .mu.m Ti film was in tension after **sputtering** at -2.7 kV, a substrate bias of -50, V, and an av. temp. of 180.degree.. Relatively broad pole d. plots were found for the (002) and (**110**) planes. The (100) and (**110**) planes gave peaks parallel to (111) Si. Intrinsic strains from embedded Ar were detd. from .chi. scan x-ray data.
CC 75-1 (Crystallization and Crystal Structure)
ST **sputtered** molybdenum titanium strain **texture**
IT **Sputtering**
(in molybdenum and titanium film deposition, x-ray detn. of strain and **texture** in relation to)
IT 7439-98-7, properties
(strain and **texture** in **sputtered** films of, on silicon, x-ray detn. of)

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L43 ANSWER 1 OF 27 HCA COPYRIGHT 2002 ACS
133:353392 Improvement of mechanical properties of Ti/TiN multilayer film deposited by sputtering. Mori, Toshihiko; Fukuda, Syun'ichi; Takemura, Yoshihiko (Dept. of Mechanical Engineering, Nagoya University, Furo-cho, Chikusa-ku, Nagoya, Aichi, 464-8603, Japan). Nippon Kikai Gakkai Ronbunshu, C-hen, 66(647), 2409-2416 (Japanese) 2000. CODEN: NKCHDB. ISSN: 0387-5024. Publisher: Nippon Kikai Gakkai.
AB Increasing requirements on coating properties results in trends to develop new systems, the most important of which is a multilayer coating. Multilayer coating can solve simultaneously very different requirements that the coating can meet at both the substrate/coating interface and the upper functional layer of the coating. Ti/TiN multilayer coatings were deposited on a silicon (100) surface using

rf magnetron sputtering, using multi S-guns. Under the condition in which the total thickness was kept at 150 nm, the nos. of layers were changed from 4 to 40. Mech. properties of a film were improved by straining and preferable cryst. orientation. Energy evolved in the coating during its growth can dissipate, and this may decrease internal stresses in the coating, improve its resistance to mech. loadings, and prevent breaking of the coating. A mechanism of improving mech. properties with increase of a layer no. was discussed based on various analyses and measurements, i.e., Augier electron spectroscopy, x ray diffraction, nano-indenting test, scratch test, and at. force microscopy. Suppose that the overall energy Whkl of multilayer film with a const. overall thickness is the sum of the surface or interface energy Shkl and strain energy Uhkl, (Whkl=Shkl + nUhkl, where n is layer no.), the preferred orientation of the film grown by **phys. vapor deposition** is decided by the lowest conditions Whkl resulting from a crit. competition between Shkl and Uhkl. Therefore a film should exhibit preferred orientation of the lowest Uhkl at small n but exhibit that of the lowest Shkl at large n. The preferred orientation is predicted to change from (111) to (100) with increase of layer no. because S(100)<S(111) and U(100)>U(111). XRD gives the expected result. Relative strengths .sigma./.tau. along [100] and [111] can be estd. for the slip system of TiN, (100).ltbbrac.**110**.rtbbrac., by using Schmid's law.

CC 56-4 (Nonferrous Metals and Alloys)
Section cross-reference(s): 57

IT Films
Hardness (mechanical)
Multilayers
Sputtering
Surface structure
Texture (metallographic)
Yield strength
(improvement of mech. properties of Ti/TiN multilayer film deposited by sputtering)

L43 ANSWER 2 OF 27 HCA COPYRIGHT 2002 ACS

133:304240 Properties and decomposition behaviors of reactively sputtered Pt(O) electrode materials. Saenger, K. L.; Rossnagel, S. M. (IBM Research Division, T.J. Watson Research Center, Yorktown Heights, NY, 10598, USA). Mater. Res. Soc. Symp. Proc., 596(Ferroelectric Thin Films VIII), 57-65 (English) 2000. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB The possibility that oxygen-contg. Pt might be superior to conventional Pt as an electrode for high-epsilon (HE) and ferroelec. (FE) perovskites led to renewed interest in the family of Pt(O) materials. Here the authors report on the properties and decompn. behaviors of reactively sputtered Pt(O)-PtOx electrode materials having x in the range 0 to .apprx.1.4. Phases of Pt(O) identified included <111>-**textured** cubic Pt (x < 0.2), tetragonal PtO (x .apprx. 1), and amorphous platinum oxide a-PtOx (x .apprx. 1.4). Film **texture**, morphol., resistivity, adhesion, and oxygen

content were examd. before and after annealing in O2 and N2 at temps. approximating those of HE/FE deposition and processing (400-650.degree.). After annealing at 650.degree. for 5 min, all Pt(O) films lost oxygen and showed growth in metallic Pt phases whose orientations were often <200> or <**220**> rather than the <111> orientation typically produced by **phys**. **vapor deposition** of the pure metal. Pt(O) films having a PtO-like structure typically showed only surface oxygen loss, with close to original oxygen levels left in the film bulk, suggesting that the oxygen in these films may be retained long enough to have a beneficial effect on HE/FE layers at later stages in processing.

CC 76-8 (Electric Phenomena)

L43 ANSWER 3 OF 27 HCA COPYRIGHT 2002 ACS

133:286968 **Texture** control in thin films using ion bombardment. Was, G. S.; Ji, H.; Ma, Z. (Department of Nuclear Engineering and Radiological Sciences, The University of Michigan, Ann Arbor, MI, 48109-2104, USA). Textures Microstruct., 34(2), 105-118 (English) 2000. CODEN: TEMIDK. ISSN: 0730-3300. Publisher: Gordon & Breach Science Publishers.

AB The development of **texture** in thin films under ion bombardment is believed to occur due to the preferential growth of the aligned grains in the film relative to the unaligned grains. The difference in growth rates between aligned and unaligned grains results in the development of **texture** with increasing thickness. Both out-of-plane (fiber) and in-plane **texture** can be controlled during ion bombardment. Expts. were performed to create a (**110**) out-of-plane **texture** in thin aluminum films and to create a (**110**) in-plane **texture** in niobium films. The **texture** in both cases increases in strength with depth, and for 500 nm Al films, the (**110**) **texture** was stronger than the thermodynamically-preferred (111) **texture** obtained by **phys**. **vapor deposition**. Results confirm a **texturing** mechanism based on ion channeling and preferential sputtering.

CC 66-3 (Surface Chemistry and Colloids)

ST ion bombardment film **texture** control

IT Vapor deposition process
    (chem.; **texture** control in thin films using ion bombardment)

IT Ion beams
    Ion bombardment
    Sputtering
    Thickness
    (**texture** control in thin films using ion bombardment)

IT Surface structure
    (**texture**; **texture** control in thin films using ion bombardment)

L43 ANSWER 4 OF 27 HCA COPYRIGHT 2002 ACS

133:153755 Deposition and characterization of NiAl and Ni-Al-N thin films from a NiAl compound target. Zhong, D.; Moore, J. J.; Ohno, T. R.; Disam, J.; Thiel, S.; Dahan, I. (Advanced Coatings and Surface Engineering Laboratory (ACSEL), Colorado School of Mines, Golden, CO, 80401-1887, USA). Surf. Coat. Technol., 130(1), 33-38 (English) 2000. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB NiAl and Ni-Al-N thin films have been deposited from a dense and homogeneous NiAl compd. target onto various substrates, including stainless steel, glass, and Si wafer, by using RF magnetron sputtering. The films have been characterized using X-ray diffraction, XPS, Auger electron spectroscopy, SEM, and scanning TEM. Both the NiAl and Ni-Al-N thin films exhibited the near equiat. NiAl phase. The Ni-Al-N thin films showed an increasing nitrogen content with increasing the amt. of N2 in the sputtering atm. during deposition. XPS spectra confirmed the possible formation of aluminum nitride in the Ni-Al-N films. The **texture**, compn., and microstructure of the NiAl films change with the discharge power used. The NiAl thin films deposited using 500 W RF power exhibited the microstructure of a 0.5-0.7-.mu.m amorphous layer adjacent to the substrate and a dense and columnar zone T cryst. microstructure which had a preferred orientation [**110**]. The Ni-Al-N films showed a homogeneous microstructure of very fine (nano scale) NiAl (**110**) grains distributed into an amorphous matrix. The results confirm the feasibility of producing high-quality NiAl and Ni-Al-N thin films from a NiAl compd. **PVD** target.

CC 56-6 (Nonferrous Metals and Alloys)

IT Sputtering
Texture (metallographic)
(deposition and characterization of NiAl and Ni-Al-N thin films from NiAl compd. sputtering target)

L43 ANSWER 5 OF 27 HCA COPYRIGHT 2002 ACS

132:327790 Preferred orientation of copper phthalocyanine thin films evaporated on amorphous substrates. Resel, R.; Ottmar, M.; Hanack, M.; Keckes, J.; Leising, G. (Institut fur Festkorperphysik, Technische Universitat Graz, Graz, A-8010, Austria). J. Mater. Res., 15(4), 934-939 (English) 2000. CODEN: JMREEE. ISSN: 0884-2914. Publisher: Materials Research Society.

AB Cu phthalocyanine thin films were prepd. on amorphous substrates using **phys. vapor deposition** at ambient temp. Different sample prepn. conditions were used: the deposition rate was varied, and the substrates was static or rotating. The preferred orientation in the thin film was studied as a function of the deposition conditions. X-ray diffraction anal. was performed using .theta./2.theta. and pole figure measurements. In the case of layers prepd. at low deposition rates and using non-rotating substrates, a very strong fiber **texture** was detected with (100) crystallog. planes oriented preferably parallel to the substrate surface. At higher deposition rates, an addnl. 2nd type of preferred orientation was obsd. with (**110**) planes

oriented preferably parallel to the substrate surface. In the case of layers prepd. with rotational substrates, the (**110**) type of preferred orientation was quant. more strongly developed. If the authors consider electronic band structure calcns., these results imply that the electron/hole transport through the thin films is enhanced for films prepd. at high deposition rates and rotating substrates.

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 76

ST **phys vapor deposition** copper phthalocyanine film orientation carrier transport

IT Microstructure
(fiber **texture**; preferred orientation of copper phthalocyanine thin films evapd. on amorphous substrates)

IT **Vapor deposition** process
(**phys**.; preferred orientation of copper phthalocyanine thin films evapd. on amorphous substrates)

L43 ANSWER 6 OF 27 HCA COPYRIGHT 2002 ACS

132:111248 Deposition of NiAl thin films from NiAl compound target fabricated via combustion synthesis. Zhong, D.; Moore, J. J.; Disam, J.; Thiel, S.; Dahan, I. (Advanced Coatings and Surface Engineering Laboratory (ACSEL), Colorado School of Mines, Golden, CO, USA). Surf. Coat. Technol., 120-121, 22-27 (English) 1999. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB A dense and homogeneous NiAl compd. target has been fabricated via a novel, one-step process - combustion synthesis simultaneously coupled with hot pressing. NiAl thin films have been successfully deposited from this NiAl target onto various substrates, including 304 stainless steel, glass, and Si.ltbbrac.100.rtbbrac. wafer, by using RF magnetron sputtering. The films have been characterized using X-ray diffraction, XPS, SEM, and scanning transmission electron microscopy. The **texture**, compn., and microstructure of the NiAl films change with the deposition power used. The NiAl thin films deposited using 500 W RF power exhibited a microstructure of a 0.5-0.7 .mu.m amorphous layer adjacent to the substrate and a dense and columnar zone T cryst. microstructure which had a preferred orientation [**110**] which is the close-packed direction for NiAl. The results confirm the feasibility of producing high quality NiAl thin films from a NiAl compd. **PVD** target. By successfully manipulating the synthesis parameters of the target and deposition parameters of the film, a NiAl thin film can be designed to meet the needs for various high temp. applications.

CC 56-6 (Nonferrous Metals and Alloys)

L43 ANSWER 7 OF 27 HCA COPYRIGHT 2002 ACS

132:96791 Microstructural characterization of binary and ternary hard coating systems for wear protection part II: Ti(CN) PACVD coatings. Dorfel, I.; Osterle, W.; Urban, I.; Bouzy, E.; Morlok, O. (Federal Institute for Materials Research and Testing, Unter den Eichen 87, Berlin, D-12205, Germany). Surf. Coat. Technol., 116-119, 898-905

(English) 1999. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..
AB A series of Ti(CN) coatings including TiN and TiC were produced by plasma-assisted chem. vapor deposition (PACVD). Systematic changes of microstructure and **texture** were investigated by anal. transmission electron microscopy (TEM) and X-ray diffraction (XRD). With increasing carbon content, a transition from an equiaxed grain structure with random orientation distribution to a fan-like structure showing a weak 111 **texture**, and finally a very fine columnar structure with **110 texture** was obsd. Most coatings had a mono-phase cubic TiN or TiC structure, except that with the highest carbon content which was composed of TiC columns and a graphite-like constituent in intercolumnar regions. Ball on disk reciprocated sliding tests revealed a significant redn. of the coeff. of friction for the bi-phase structure compared to mono-phase Ti(CN).
CC 57-2 (Ceramics)
ST microstructure titanium carbonitride coating plasma assisted **PVD** wear protection

L43 ANSWER 8 OF 27 HCA COPYRIGHT 2002 ACS
132:25435 Aluminum metallization for flat-panel displays using ion-beam-assisted **physical vapor deposition**. Ma, Zhenqiang; Was, Gary S. (Department of Nuclear Engineering and Radiological Sciences, The University of Michigan, Ann Arbor, MI, 48109, USA). J. Mater. Res., 14(10), 4051-4061 (English) 1999. CODEN: JMREEE. ISSN: 0884-2914. Publisher: Materials Research Society.
AB Failures in aluminum interconnects in display control devices are often caused by the formation of hillocks during post-deposition annealing. Ion-beam-assisted deposition was used to create a (**110**) out-of-plane **texture** in aluminum films to suppress hillock formation. X-ray diffraction was used to quantify the (**110**)/(111) out-of-plane **texture** ratio, and SEM and at. force microscopy were used to characterize the surface topol. No hillocks were obsd. on (**110**)-**textured** aluminum films following annealing for 30 min at 450.degree.. Following annealing, resistivity of the films made by ion-beam-assisted deposition recovered to within a factor of 2 of the **phys.-vapor-deposition** films. Ion-beam-assisted deposition can effectively modify the aluminum out-of-plane **texture** in such a way that hillock suppression can be achieved without a significant change in resistivity.
CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 76
ST **PVD** ion plating aluminum surface structure
IT Surface structure
(aluminum metalization for flat-panel displays using ion-beam-assisted **PVD**)
IT Vapor deposition process
(ion plating; aluminum metalization for flat-panel displays using

ion-beam-assisted **PVD**)
IT 7429-90-5, Aluminum, processes
(aluminum metalization for flat-panel displays using
ion-beam-assisted **PVD**)

L43 ANSWER 9 OF 27 HCA COPYRIGHT 2002 ACS
131:279686 Structural and giant magnetoresistive properties in AgNiFe and AgFe thin granular magnetic films. Halim, S. A.; Lim, K. P.; Hashim, M.; Chow, S. P.; Zainuddin, H.; Saion, E. B. (Department of Physics, Faculty of Sciences and Environmental Studies, Serdang, 43400, Malay.). J. Fiz. Malays., 19(3), 93-97 (English) 1998. CODEN: JFMAEU. ISSN: 0128-0333. Publisher: Jurnal Fizik Malaysia.
AB Granular magnetic thin films of Ag100-yFey and Ag100-x-yNixFey (x = 0-26; yr = 18-25) with optimum condition and compn. have been prepd. by means of a radio-frequency magnetron **sputtering** system. The giant magnetoresistance (GMR) value up to 3% at 1 T measured at room temp. was found for the sample Ag74.6Ni5.3Fe20.1 deposited for 80 min. The x-ray diffraction spectra of the films show the formation of a .ltbbrac.111.rtbbrac., .ltbbrac.200.rtbbrac., and .ltbbrac.**220**.rtbbrac. **fcc**. Ag structure. The deposition rate and the compns. dictate the dominant formation of specific crystallog. structure, which influence the GMR effect. Hence, it could be concluded that the ratio of 25% of magnetic entity to 75% of non-magnetic matrix forms the basis for obtaining high GMR values.
CC 76-1 (Electric Phenomena)

L43 ANSWER 10 OF 27 HCA COPYRIGHT 2002 ACS
130:255296 Heterogeneity of **textures** and stresses in a large tungsten **PVD** film. Garot-Piant, A.; Le Cornec, A.; Lebrun, J. L.; Paturaud, C. (LM3-MET X - URA CNRS 1219 - ENSAM Paris, Paris, 75013, Fr.). High Temp. Mater. Processes (N. Y.), 2(3), 401-418 (English) 1998. CODEN: HTMPFG. ISSN: 1093-3611. Publisher: Begell House, Inc..
AB This study deals with **texture** and stress evaluations on W coatings on a large steel plate (150.perp..times.240 mm2), as a function of its position with the magnetron target. The films obtained by **Phys. Vapor Deposition** process often reveal a fiber **texture**, implying a residual stress detn. impossible by the usual X-rays diffraction method. The beam curvature technique is also difficult to apply in the case of thick substrates, justifying our interest of the x-rays diffraction methods. The stress detn. method is then the Ideal Directions Method. Concerning the heterogeneity all over the film, at the coating surface, an almost perfect <111> fiber **texture** with slight reinforcements and a very high compressive (around -3000 MPa) and almost isotropic stress level are obsd. The fiber **texture** presents a progressive W inclination in connection with the columnar morphol., according to the short and long target axis; this inclination is in relation with ion incidence direction. The stresses were rather homogeneous all over the surface with a small decrease. Concerning the heterogeneity within the thickness,

the <111> fiber **texture** transforms towards a (**110**
) <**110**> **texture** toward the interface and a
slight stress gradient is obsd.
CC 55-6 (Ferrous Metals and Alloys)
ST tungsten metallog **texture** sputter coating steel; residual
stress tungsten sputter coating steel
IT Films
Residual stress
Sputter deposition
Texture (metallographic)
(heterogeneity of metallog. **textures** and residual
stresses in large tungsten sputtered film on steel substrate)
IT 98240-83-6, 35NCDV12
(heterogeneity of metallog. **textures** and residual
stresses in large tungsten sputtered film on steel substrate)
IT 7440-33-7, Tungsten, properties
(heterogeneity of metallog. **textures** and residual
stresses in large tungsten sputtered film on steel substrate)

L43 ANSWER 11 OF 27 HCA COPYRIGHT 2002 ACS
129:206010 Mechanical and tribological properties of ZrC/VC alloy films
deposited by sputtering and pulsed laser deposition. Brock, W. F.;
Krzanowski, J. E.; Leuchtner, R. E.; Legore, L. J.; Frankel, D. J.
(University of New Hampshire Department of Mechanical Engineering,
Durham, NH, 03824, USA). Mater. Res. Soc. Symp. Proc.,
505(Thin-Films--Stresses and Mechanical Properties VII), 261-266
(English) 1998. CODEN: MRSPDH. ISSN: 0272-9172. Publisher:
Materials Research Society.
AB A study has been conducted on ZrC/VC solid soln. thin films prepd.
by both pulsed laser deposition (PLD) and RF magnetron sputtering.
The phase formation, wear properties, and hardness of these thin
films were examd. A ceramic target comprised of 36% VC and 64% ZrC
(at.%) was used to deposit films at 20.degree., 200.degree., and
400.degree. C. The nominal film thickness was 0.6 .mu.m. X-ray
diffraction (XRD) anal. revealed these films were carbide
solid-solns. and showed a preference for (100) orientation for
sputter-deposited films and a (**110**) orientation for laser
deposition. More highly oriented films were obtained at elevated
temps. as evidenced by rocking curve measurements on the PLD films.
The FWHM of the peaks ranged from 2.2.degree. to 8.3.degree. for
films deposited at 400.degree. C and 20.degree. C, resp. Using
time-of-flight quadrupole mass spectrometry (TOFQMS), we performed
plume diagnostics to measure particle energies and the
thermalization effects of the background gas. In vacuum, typical
ion energies ranged from .apprx.5-100 eV while the neutral atoms had
kinetic energies from .apprx.1-5 eV. Our measurements show that the
background gas can be used to selectively thermalize low mass
components in the plume. From measured kinetic energies and
collision effects of the gas, the changes in crystallog. structure
of the solid soln. with pressure appear to result from
collision-induced effects from condensation of the Zr atoms. This
"heavy" atom effect may be an important new processing parameter

with which to adjust film morphol. and crystal **texture**.
CC 57-2 (Ceramics)
IT **Physical vapor deposition**
(pulsed laser; mech. and tribol. properties of ZrC/VC alloy films deposited by sputtering and pulsed laser deposition)

L43 ANSWER 12 OF 27 HCA COPYRIGHT 2002 ACS
129:111885 Influences of ion energy on morphology and preferred orientation of chromium thin films prepared by ion beam and vapor deposition. Kuratani, Naoto; Ebe, Akinori; Ogata, Kiyoshi (R & D Division, Nissin Electric Co., Ltd., 47 Umezu-Takase-cho, Ukyo-ku, Kyoto, 615-8686, Japan). J. Vac. Sci. Technol., A, 16(4), 2489-2494 (English) 1998. CODEN: JVTAD6. ISSN: 0734-2101. Publisher: American Institute of Physics.
AB The influences of ion irradn. on morphologies and preferred orientations of Cr thin films prepd. by ion-beam and vapor deposition were studied. Cr films were prepd. onto Si .ltbbrac.100.rtbbrac. wafers by electron beam evapn. of Cr and simultaneous irradn. with Ar ions. The energies of Ar ions were changed in the range of 0.5-20.0 keV, and transport ratios of irradiated Ar ions to vaporized Cr atoms, Ar/Cr, to the substrates were kept at 0.033. Vaporized Cr atoms were deposited onto substrates at an angle of 45.degree. and Ar ions were irradiated normal to the substrates. Si substrates were kept at low temp. during deposition. The exptl. results show that the morphologies and the preferred orientations were varied due to the change of ion irradn. energy though other conditions were const. Every Cr film takes a clear columnar structure. The column widths of Cr films are augmented with an increase of ion energy. The columnar growth direction turns toward the deposition direction with increase of ion energy up to 5.0 keV. With further increase of ion energy the direction changes to perpendicular to the substrate, parallel to the direction of the ion irradn. The preferred orientation to the substrate normal changes from random to .ltbbrac.100.rtbbrac. orientation through .ltbbrac.**110**.rtbbrac. and .ltbbrac.100.rtbbrac. orientation with increasing of ion energy. The reasons were understood as the mixed effects of nuclear and electronic energy transfers due to the collisions between Cr atoms and irradiated Ar ions.
CC 56-6 (Nonferrous Metals and Alloys)
IT Electron beam vapor deposition
Films
Ion bombardment
Texture (metallographic)
(effect of Ar ion energy on morphol. and preferred orientation of Cr thin films prepd. by ion beam irradn. during electron beam evaporative **phys.-vapor deposition**)
IT 7440-47-3, Chromium, processes
(effect of Ar ion energy on morphol. and preferred orientation of Cr thin films prepd. by ion beam irradn. during electron beam evaporative **phys.-vapor deposition**)
IT 7440-37-1, Argon, processes

(ions; effect of Ar ion energy on morphol. and preferred orientation of Cr thin films prepd. by ion beam irradn. during electron beam evaporative **phys.-vapor deposition**)

L43 ANSWER 13 OF 27 HCA COPYRIGHT 2002 ACS
128:247455 Pulsed laser deposition of mixed metal carbide coatings. Leuchtner, R. E.; Krzanowski, J. E.; Brock, W. F. (Department of Physics, University of New Hampshire, Durham, NH 03824, S. Afr.). Hard Coat. Borides, Carbides Nitrides: Synth., Charact. Appl., Proc. Int. Symp., 233-247. Editor(s): Kumar, Ashok; Chung, Yip-Wah; Chia, Ray W. J. Minerals, Metals & Materials Society: Warrendale, Pa. (English) 1998. CODEN: 65UIAV.

AB Multi-component and multiphase metal carbide coatings for rolling and sliding contact applications were developed. Coatings were fabricated using pulsed laser deposition (PLD), a vapor deposition process that combines high kinetic energies of a condensing vapor with near at.-level control of the surface compn. Single and multilayer coatings of TiC, VC, and ZrC and alloy coatings of ZrC/VC were deposited. The films were evaluated using x-ray diffraction, at. force microscopy, nano-indentation, and pin-on-disk friction and wear testing. The single component films were typically polycryst. with a preferred (111) **texture**. The ZrC/VC alloy films were (**110**) oriented when deposited at pressures of 0.025 torr or less, but the **texture** changed abruptly to (111) at higher deposition pressures. Using time-of-flight quadrupole mass spectrometry (TOFQMS), plume diagnostics were carried out to measure particle energies and the effects of the background gas, which can be used to selectively thermalize various components in the plume. From measured kinetic energies, the changes in film **texture** with pressure appear to result from collision-induced effects from condensation of Zr atoms. This effect is an important processing parameter with which to adjust film morphol. and **texture**. The friction coeff. for TiC, VC, and ZrC films deposited at 400.degree. was 0.2, 0.8, and 0.5, resp. The (**110**) ZrC/VC alloy films deposited at 0.005 torr and 400.degree. performed far better in the friction and wear tests, and were harder than the other films. This behavior was a result of the ion-induced effects, resulting in dense, highly oriented films, and a lower the no. of particulates on the film surface.

CC 57-7 (Ceramics)
Section cross-reference(s): 56

ST metal carbide hard coating vapor deposition; crystallinity **texture** metal carbide deposition temp

IT Coatings
(hard; pulsed laser deposition and **texture** and morphol. of mixed metal carbide hard coatings)

IT Crystallinity
Multilayers
Physical vapor deposition
Sliding friction
Surface composition

Wear
(pulsed laser **deposition** and **texture** and morphol. of mixed metal carbide hard coatings)

IT 12070-08-5, Titanium carbide (TiC) 12070-10-9, Vanadium carbide (VC) 12070-14-3, Zirconium carbide (ZrC)
(pulsed laser deposition and **texture** and morphol. of mixed metal carbide hard coatings)

L43 ANSWER 14 OF 27 HCA COPYRIGHT 2002 ACS

127:270899 Microstructure control for thin film metalization. Was, G. S.; Srolovitz, D. J.; Ma, Z.; Liang, D. (Nuclear Engineering and Radiological Sciences, University of Michigan, Ann Arbor, MI, 48109, USA). Mater. Res. Soc. Symp. Proc., 441(Thin Films--Structure and Morphology), 311-322 (English) 1997. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.

AB A strategy was developed for controlling hillock formation in thin metal films by controlling the fiber **texture** to be of a relatively weak orientation. Two-dimensional mol. dynamics (MD) simulations were performed to det. the parameter dependencies of **texturing** under ion beam assisted deposition. Simulations showed that even for film orientations that have a lower no. of nearest neighbor surface bonds, the redn. in sputtering rate by ion channeling will favor the growth of the grains aligned with their channeling direction in the direction of the ion beam. Higher energies should result in greater sputtering and a higher surface roughness. Confirmatory expts. were performed by growing Al films using ion beam assisted deposition in which the Ne ion beam was normal to the substrate surface. For all energies above 0 eV/atom, the fiber **texture** contained a (**220**) component and, at high normalized energies, the fiber **texture** was heavily (**220**) dominated. Subsequent annealing at 450.degree. for 30 min resulted in hillock formation in the **PVD** (**phys. vapor deposition**) condition, a redn. in the hillock d. by two orders of magnitude in the 120 eV/atom condition and complete elimination of hillocking at >800 eV/atom. Although the surface roughness increased with ion beam energy as modeled by MD, the surface became smoother during annealing. The fiber **texture** can be controlled in a thin metal film in such a way as to eliminate hillock formation, mol. dynamics simulation is a valuable predictive tool for guiding expts. in the development of thin film microstructures and ion beam assisted deposition is an effective, practical tool for controlling microstructures of thin metal films.

CC 76-2 (Electric Phenomena)
Section cross-reference(s): 56, 66

ST ion sputtering vapor deposition metalization roughness; aluminum ion sputtering vapor deposition; hillock aluminum ion sputtering vapor deposition; fiber **texture** aluminum deposition

IT Electric conductors
Ion beam sputtering
Ion channeling
Metalization (process)

Surface roughness
Texture (metallographic)
Vapor deposition process
(ion beam sputtering in controlling hillock formation in thin metal films by controlling fiber **texture**)

IT 7440-01-9D, Neon, ions, processes
(ion beam sputtering in controlling hillock formation in thin metal films by controlling fiber **texture**)

IT 7429-90-5, Aluminum, properties
(ion beam sputtering in controlling hillock formation in thin metal films by controlling fiber **texture**)

IT 7440-21-3, Silicon, processes
(substrate; ion beam sputtering in controlling hillock formation in thin metal films by controlling fiber **texture**)

L43 ANSWER 15 OF 27 HCA COPYRIGHT 2002 ACS

126:345946 Effect of bombardment on in-plane **texture**, surface morphology, and microstructure of vapor deposited Nb thin films. Ji, Hong; Was, Gary S.; Jones, J. Wayne; Moody, Neville R. (Physics Department, Univ. of Michigan, Ann Arbor, MI, 48109, USA). J. Appl. Phys., 81(10), 6754-6761 (English) 1997. CODEN: JAPIAU. ISSN: 0021-8979. Publisher: American Institute of Physics.

AB Nb films were deposited (**PVD**) and ion-beam-assisted deposition (IBAD) using ion energies of 0, 250, 50 and 1000 eV, and R ratios (ion-to-atom arrival rate ratio) of 0, 0.1, and 0.4 on Si, amorphous glass, and sapphire substrates of thickness 50-1000 nm. Besides a {110} fiber **texture**, an in-plane **texture** was created by orienting the ion beam with respect to the substrate. The in-plane **texture** as measured by the degree of orientation in the films followed a linear relation with the energy per deposited atom, En. The grain structure was columnar and the column width increased with normalized energy. The surface morphol. depended on both the normalized energy of the ion beam and the film thickness. All films had dome-like surface features that were oriented along the ion-beam incident direction. The dimension of these features increased with normalized energy and film thickness. Surface roughness also increased with normalized energy and film thickness, with the root-mean-square roughness increasing from 1.6 nm for the **PVD** sample (100 nm thick) to 36.7 nm for the IBAD film (1000 eV, R = 0.4, 800 nm thick). Both the surface morphol. evolution and in-plane **texture** development in these films were the result of the different ion sputter rates among differently oriented grains.

CC 56-6 (Nonferrous Metals and Alloys)

ST bombardment effect plane **texture** surface morphol; microstructure vapor deposited niobium film morphol

IT Films
Sputtering
Surface
Texture (metallographic)
(effect of bombardment on in-plane **texture**, surface morphol., and microstructure of vapor deposited Nb thin films)

IT 7440-03-1, Niobium, processes
(effect of bombardment on in-plane **texture**, surface morphol., and microstructure of vapor deposited Nb thin films)

L43 ANSWER 16 OF 27 HCA COPYRIGHT 2002 ACS
126:160431 Effects of deposition parameters on the **texture** of chromium films deposited by vacuum arc evaporation. Gautier, C.; Machet, J. (Faculte Sciences, LMCTS, Limoges, 87060, Fr.). Thin Solid Films, 289(1-2), 34-38 (English) 1996. CODEN: THSFAP. ISSN: 0040-6090. Publisher: Elsevier.

AB The aim of this paper is to elucidate the influence of the deposition parameters on the structure and the **texture** of thin chromium films obtained by vacuum arc evapn. Both parameters related directly to the deposition process such as the argon pressure, arc current and bias voltage, and those concerning the substrate such as its temp. and its nature, are taken into consideration. The structure and the **texture** were analyzed by X-ray diffraction (XRD). It was found that only two parameters have a strong influence on these characteristics: the substrate temp. and the bias voltage. The increase in substrate temp. causes the (**110**) **texture** to change to a (200) **texture**, whereas the increase in bias voltage (in abs. value) tends to enhance the (**110**) **texture**. It was also found that the **texture** of the chromium films seems to be very sensitive to the presence of impurities.

CC 56-6 (Nonferrous Metals and Alloys)

ST chromium **PVD** film metallog **texture**

IT Films
Physical vapor deposition
Texture (metallographic)
(**deposition** parameter effects on **texture** of chromium films deposited by vacuum arc evapn.)

IT 7440-47-3, Chromium, processes
(deposition parameter effects on **texture** of chromium films deposited by vacuum arc evapn.)

L43 ANSWER 17 OF 27 HCA COPYRIGHT 2002 ACS
125:253674 Variation of **textures** of TiN deposited on (011) [100] single crystal of silicon steel due to difference in **PVD** coating method. Inokuti, Yukio (Technical Research Laboratories, Kawasaki Steel Corp., Chiba, 260, Japan). Tetsu to Hagane, 82(10), 841-846 (Japanese) 1996. CODEN: TEHAA2. ISSN: 0021-1575.

AB To clarify the difference in the **textures** of TiN film due to **PVD** coating methods, TiN ceramic coating by HCD (Hollow Cathode Discharge) and EB (Electron Beam)+RF (Radio Frequency) methods was done on the surface of polished silicon steel samples. Pole figures of dual **textures** of the TiN film and related silicon steel samples were measured simultaneously using SSD (Solid State Detector) auto pole figure app. (111)TiN Pole figure of TiN film done by the HCD method showed the dominant **texture** of (111) [**110**] orientation, and (100)SI-steel pole figure of

(011) [100] single crystal of silicon steel showed the dominant **texture** of (011) [100] orientation, in which two (**220**)TiN pole peaks of TiN film on TD axis were detected simultaneously, and their conjugated pole peaks manifested elliptical shape. Due to the higher ionization by the HCD method than that by EB+RF, it was possible for TiN film to form the dominant **texture** of (111)[**110**] orientation, resulting in a fine and smooth TiN film with good adhesion, thereby endowing the TiN-coated silicon steel sheet with a reduced iron loss.

CC 55-6 (Ferrous Metals and Alloys)

ST steel titanium nitride **PVD texture**

IT **Texture**, metallographic
Vapor deposition processes
(variation of **textures** of titanium mononitride deposited on single crystal of silicon steel due to difference in **phys. vapor deposition** coating method)

IT 59644-26-7, processes
(variation of **textures** of titanium mononitride deposited on single crystal of silicon steel due to difference in **phys. vapor deposition** coating method)

IT 25583-20-4, Titanium mononitride
(variation of **textures** of titanium mononitride deposited on single crystal of silicon steel due to difference in **phys. vapor deposition** coating method)

L43 ANSWER 18 OF 27 HCA COPYRIGHT 2002 ACS

124:35068 Determination of stress tensors in thin **textured** copper films by grazing incidence x-ray diffraction. Zendehroud, Jafar; Wieder, Thomas; Klein, Helmut (Univ. Gesamthochsch. Kassel, Kassel, Germany). Materialwiss. Werkstofftech., 26(10), 553-9 (English) 1995. CODEN: MATWER. ISSN: 0933-5137.

AB Following a brief survey on grazing incidence x-ray diffraction (SGIXRD) and the math. descriptions in several coordinate systems used for stress detn. the **phys. vapor deposition** (**PVD**) of Cu onto glass substrates is reported and also the examn. of the resulting Cu films for residual stresses and **textures** by GIXRD is described. Thus, thin Cu films (1-5 .mu.m) were deposited by ion plating onto 5 glass samples in a modified com. app. (under 1.0 Pa Ar, bias voltage -1.4 kV, deposition temp. 200.degree., growth rate 0.5-0.6 nm/s, partial pressure of O, C, and N each <3.times.10-6 Pa by mass spectrometry). **Textures** were studied by x-ray reflection in a computer operated **texture** goniometer (Co-K.alpha., 30 mm diam. of reflection samples, circular scan mode by step with .DELTA..alpha. = 0.5.degree. up to .alpha. .ltoreq. 70.degree., and .DELTA..beta. = 3.6.degree., 0.degree. .ltoreq. .beta. .ltoreq. 360.degree.); 3 pole Figures i.e. (111), (200), and (**220**) were taken for each sample and hence the orientation distribution figures were calcd.

Strain measurements were performed with a Seeman-Bohlin diffractometer with grazing incidence geometry (cf. J. Zehnderoud et al., 1993). The stress tensor components .sigma.ij of 4 samples were calcd. from measured reflection positions using **texture** -weighted elastic compliances (TWEC's) as well as **texture** independent x-ray elastic compliances (XEC's), computed according to Kroener (cf. I. C. Noyan, and J. B. Cohen, 1987). In most cases the use of TWEC's and of XEC's resulted in significantly different stress tensors.

CC 56-12 (Nonferrous Metals and Alloys)

ST stress tensor detn **textured** copper film; grazing incidence x ray diffraction copper; ion plating copper film stress

IT **Texture**, metallographic
(stress tensor detn. of ion-plated and **textured** copper film by grazing incidence x-ray diffraction)

IT Vapor deposition processes
(ion plating, stress tensor detn. of ion-plated and **textured** copper film by grazing incidence x-ray diffraction)

IT Distribution function
(orientational, stress tensor detn. of ion-plated and **textured** copper film by grazing incidence x-ray diffraction)

IT 7440-50-8, Copper, processes
(stress tensor detn. of ion-plated and **textured** copper film by grazing incidence x-ray diffraction)

L43 ANSWER 19 OF 27 HCA COPYRIGHT 2002 ACS

120:335416 On the residual stress and picostructure of titanium nitride films. II. A picostructural model. Perry, A J; Valvoda, V; Rafaja, D (Vac-Tec Syst. Inc, Boulder, CO, 80301, USA). Vacuum, 45(1), 11-14 (English) 1994. CODEN: VACUAV. ISSN: 0042-207X.

AB A model is presented in which the **texture** adopted by TiN films made by plasma-enhanced **phys. vapor deposition** (PVD) methods is affected by the lattice defects formed during growth. It is proposed that the defects formed are those whose formation absorbs a max. amt. of the energy accompanying the deposition process. Specifically, in sub- and stoichiometric films, extrinsic dislocation loops are formed on (111) planes by migration (diffusion or channeling) which then cause the [111] growth **texture** to be preferred by the film. In superstoichiometric films, the addnl. N is incorporated as dumb-bell pairs in 2nd nearest neighbor tetrahedral sites oriented in the [200] or [**220**] directions which cause these to be the favored growth **textures**. It is considered that the trapped Ar is assocd. with the extrinsic loops in the former case.

CC 75-3 (Crystallography and Liquid Crystals)

ST titanium nitride growth **texture** argon trapping; defect titanium nitride film growth

IT 25583-20-4, Titanium nitride tin
(growth **texture** of, from plasma-enhanced **phys. vapor deposition**, effect of stoichiometry

on)
IT 7440-37-1, Argon, properties
(trapping of, in titanium nitride film growth by plasma-enhanced **phys. vapor deposition**, **texture** in relation to)

L43 ANSWER 20 OF 27 HCA COPYRIGHT 2002 ACS
119:144216 Synthesis and properties of molybdenum/molybdenum silicide microlaminates using ion beam assisted deposition. Mashayekhi, A.; Parfitt, L.; Kalnas, C.; Jones, J. W.; Was, G. S.; Hoffman, D. W. (Univ. Michigan, Ann Arbor, MI, 48109, USA). Mater. Res. Soc. Symp. Proc., 273(Intermetallic Matrix Composites II), 275-80 (English) 1992. CODEN: MRSPDH. ISSN: 0272-9172.
AB Films of Mo, MoSix and Mo/MoSix (1.22<x<1.35) multilayers were formed by **phys. vapor deposition** (**PVD**) and ion beam assisted deposition (IBAD) onto (100) Si, glass, and graphite substrates. Ion to atom arrival rate (R) ratios for IBAD varied from 0.01 to 0.1 and film thicknesses varied from 200 to 1100 nm. The Si/Mo ratio decreased with increasing R ratio. The oxygen content of Mo films was greater than silicide films, but both decreased substantially with increasing R ratio. Ar incorporation increased with increasing R ratio to a max. of 1 at.% in Mo and 5 at.% in MoSi1.22. Mo films exhibit a strong (**110**) fiber **texture** at low R ratios. At the highest R ratio, a tilting of the (**110**) fiber **texture** by 15.degree. occurs, along with the development of a distinct azimuthal **texture** indicative of planar channeling of the ion beam along (**110**) planes. The microstructure of the multilayer consists of small Mo grains and an amorphous silicide. Av. film stress in Mo films increases from tension to a max. value of 0.63 GPa and becomes compressive with increasing normalized energy. The stress in the MoSix films decreases with increasing normalized energy and sats. at a compressive stress of -0.24 GPa at 25 eV/atom. Indentation fracture expts. using a Vickers indenter with a 300 g load show a fracture behavior that is consistent with a residual stress effect for the IBAD monolithic MoSix and microlaminate, but which is influenced by addnl. factors in the **PVD** microlaminate.
CC 56-6 (Nonferrous Metals and Alloys)
ST molybdenum silicide multilayer composite deposition; ion beam deposition molybdenum composite; **texture** molybdenum ion beam deposition
IT **Texture**, metallographic
(of molybdenum films, ion beam-assisted deposition effects on)

L43 ANSWER 21 OF 27 HCA COPYRIGHT 2002 ACS
118:9765 Recent progress in the study of **physically vapor-deposited** coatings produced by means of highly ionized plasmas. Stals, L. M. M.; Quaeyhaegens, C.; Van Stappen, M. (Inst. Mater. Res., Limburgs Univ. Cent., Diepenbeek, B-3590, Belg.). Surf. Coat. Technol., 54-55(1-3), 121-30 (English) 1992. CODEN: SCTEEJ. ISSN: 0257-8972.

AB To the existing data on the effects of substrate temp., bias voltage, substrate c.d., and deposition rate on the microstructure of hard **phys. vapor-deposited** coatings, this paper adds new results on these phenomena, obtained by x-ray diffraction in Field-Merchant reflection mode for **phys. vapor-deposited** TiN on AISI 304 and AISI H13 substrates. There is a combined effect on the preferential orientation by the coating of the nature of the substrate surface (metallurgical compn. and preferential orientation) on the one hand and by the energy deposition per condensing atom on the other hand. Although the substrate surfaces of both materials are preferentially orientation-free, the coating starts to grow on AISI H13 without any preferential orientation independent of the applied voltage V = Vb - Vp (Vb is the bias voltage, and Vp the plasma potential) in the range [-60 V, -160 V], as could be expected, whereas on AISI 304 a (200) orientation develops. At larger thickness (.apprx.1.5 .mu.m) a (220)-(111) **texture** is obsd. for both substrate materials with a mosaic spread of .apprx.8-10.degree. for both orientations, except for the -60 V case for AISI H13, where a mosaic spread of .apprx.34.degree. is obsd. for the (111) orientation, and for the -60 V case for AISI 304 where the initial (200) **texture** survived with a small increase in mosaic spread to .apprx.9.degree.. Data on the internal macroscopic residual stresses for TiN on AISI H13 show that they are compressive and that they decrease with decreasing deposition energy. Because a larger mosaic spread of the preferential orientation is obsd. at lower energy depositions, this indicates the effect that mosaic spread may have on internal stresses. It is also obsd., on samples of ASP 23, that properties, such as hardness and conformal cracking in a scratch test, change with the amt. of compressive stress in such a way that real functional properties, such as wear resistance, might deteriorate with decreasing compressive stress. Finally, the anal. of (dhkl, sin2 .psi.) curves, which is made to det. the amt. of stress in the coating, shows that the obsd. .psi.+ - .psi.- splitting is largely explained by preferential orientation.

CC 55-6 (Ferrous Metals and Alloys)
Section cross-reference(s): 57

IT **Vapor deposition** processes
(**phys**., of titanium nitride, with highly ionized plasmas, on steel and stainless steel, preferred orientation in)

IT 11109-50-5, AISI 304 12741-56-9, AISI H13 39392-37-5, ASP 23
(**phys.-vapor deposition** of titanium nitride on, preferred orientation in)

IT 25583-20-4, Titanium mononitride
(**phys.-vapor deposition** of, on steel and stainless steel, preferred orientation in)

L43 ANSWER 22 OF 27 HCA COPYRIGHT 2002 ACS

115:140975 **Texture** analysis of martensitic hot-worked tool steel H13 coated with titanium nitride by **physical vapor deposition**. Quaeyhaegens, C.; Stals, L. M.;

Van Stappen, M. (Inst. Mater. Res., Limburgs Univ. Cent., Diepenbeek, B-3590, Belg.). Mater. Sci. Eng., A, A139, 242-8 (English) 1991. CODEN: MSAPE3. ISSN: 0921-5093.

AB With a .theta.-2.theta. decoupled x-ray diffractometer, extended with a .omega. substrate rotation, it is possible to study the preferential orientation (**texture**) of polycryst. materials in an exptl. set-up which is comparable with the Field-Merchant configuration. After having established the preferential orientation of the substrates, which were made of martensitic hot-worked tool steel H13, they were coated with TiN by **phys .-vapor deposition**. Two layer thicknesses were deposited at 2 different bias voltages. Thin TiN layers with a thickness of 200-300 nm were polycryst. while coatings with a layer thickness of 1400-1600 nm showed a preferential orientation of the (111) and (**220**) lattice planes parallel to the substrate surface. The (111) preferential orientation shows a decrease in mosaic spread with increasing bias voltage, but the mosaic spread of the (**220**) preferential orientation remains unchanged.

CC 57-2 (Ceramics)
Section cross-reference(s): 55

L43 ANSWER 23 OF 27 HCA COPYRIGHT 2002 ACS

113:176331 A further study of the state of residual stress in titanium nitride (TiN) films made by **physical vapor deposition** methods. Perry, A. J. (GTE Valenite Corp., Troy, MI, 48084, USA). J. Vac. Sci. Technol., A, 8(4), 3186-93 (English) 1990. CODEN: JVTAD6. ISSN: 0734-2101.

AB The residual stress and strain distribution in TiN films by chem. vapor deposition onto cemented carbide and **phys. vapor deposition** methods onto cemented carbide and stainless steel are studied. Two sets of samples were chosen which have strong (111) **textures** or show different **textures** resulting from different deposition rates. The residual stress on different planes in all samples, as measured by x-ray diffraction methods, is affected by the **texture** of the film. Redn. in the deposition rate increases the lattice distortion, and reduces the strain distribution and the shear stress effects on (**220**) plane. Studies of planes not lying parallel to the surface of the film are needed to allow a more complete characterization and to permit a fuller interpretation.

CC 56-6 (Nonferrous Metals and Alloys)

ST titanium nitride film **texture** stress; carbide cemented titanium nitride coating; stainless steel titanium nitride coating; residual stress titanium nitride film

IT Crystal orientation
(**texture**, of titanium nitride coatings, residual stress in relation to)

IT 25583-20-4, Titanium nitride (TiN)
(coatings, on stainless steel and cemented carbide, residual stress in, **texture** effect on)

IT 129874-26-6, Kennametal KC-730 129874-35-7, C 3
(titanium nitride coatings on, residual stresses in,

texture effect on)

L43 ANSWER 24 OF 27 HCA COPYRIGHT 2002 ACS
111:108154 Determination of the chemical composition of titanium nitride or titanium nitride carbide coatings by x-ray diffraction. Cermak, Miroslav; Neumann, Jaromir (Statni Vyzk. Ustav Mater., Prague, 113 12, Czech.). Kovove Mater., 26(4), 498-507 (Czech) 1988. CODEN: KOMAAW. ISSN: 0023-432X.
AB Nonstoichiometric TiNx and Ti(N,C)x coatings made by chem. or **phys. vapor deposition** were analyzed. The values of lattice parameters obtained from the (111), (200), and (**220**) line intensities were cor. for various effects (**texture**, strain in the coating resulting from the difference of the thermal expansion coeffs. between the coating and the substrate, macroscopic internal stress).
CC 79-6 (Inorganic Analytical Chemistry)
Section cross-reference(s): 75
ST titanium carbide nitride analysis x ray; x ray diffraction analysis coating nonstoichiometry; **texture** correction x ray diffraction analysis; stress correction x ray diffraction analysis
IT Coating materials
(anal. of, by x-ray diffraction, corrections for stress and **texture** in)
IT X-ray analysis
(diffraction, of nonstoichiometric coatings, corrections for stress and **texture** in)
IT 11116-16-8, Titanium nitride 12627-33-7, Titanium carbide nitride
(anal. of coatings of, by x-ray diffraction, corrections for stress and **texture** in)

L43 ANSWER 25 OF 27 HCA COPYRIGHT 2002 ACS
95:33768 Oxygen induced preferred orientation of d.c. **sputtered** platinum. Hecq, M.; Hecq, A. (Univ. l'Etat, Mons, B-7000, Belg.). J. Vac. Sci. Technol., 18(2), 219-22 (English) 1981. CODEN: JVSTAL. ISSN: 0022-5355.
AB Pt thin films were deposited by d.c. **sputtering** on glass substrates. The holding substrate temp. is maintained at 200.degree.. The cryst. structure of Pt is **fcc**. In pure Ar, the orientation is with the (111) plane parallel to the substrate. The orientation changes when O is mixed with Ar. Factors driving the orientation are the ratio of O partial pressure relative to the deposition rate (R) and the thickness of the film (T). For a thickness .gtoreq.630 .ANG., the film orientation is (200) when R is .apprx.3.3 .times. 10-4 Pa min .ANG.-1, and (**220**) when R is .apprx.4 .times. 10-3. When the films are thinner the orientation is (111). A correlation is found between orientation and resistivity.
CC 75-5 (Crystallization and Crystal Structure)
ST **sputtering** platinum film orientation; oxygen orientation **sputtering** platinum
IT **Sputtering**
(of platinum films, oxygen effect on orientation and)

IT 7440-06-4, properties
(**sputtering** of films of, oxygen-induced orientation of)
IT 7782-44-7, properties
(**sputtering** of platinum films in presence of, orientation in relation to)

L43 ANSWER 26 OF 27 HCA COPYRIGHT 2002 ACS
76:91069 Polymorphism in vacuum condensates of tantalum. Belevskii, V. P.; Belous, M. V.; Permyakov, V. G.; Yashnik, V. M. (Kiev. Politekh. Inst., Kiev, USSR). Fiz. Metal. Metalloved., 32(6), 1297-9 (Russian) 1971. CODEN: FMMTAK.
AB Thin Ta films (200-2000 .ANG.) were prepd. by cathode **sputtering** in an Ar atm. contg. small amts. of N, and their structure studied by x-ray anal. When examg. the structure of .alpha.-Ta films, only the diffraction lines corresponding to a bcc. lattice were detected (a 3.42 .ANG.). The .beta.-modification is characterized by a relatively high elec. resistance (.rho. = 180-**220** .mu.ohm cm) and neg. coeff. of .rho.. The cryst. lattice of this phase differs both from that of the .alpha.-phase (bcc.) and the .gamma.-phase (**fcc**. and a = 4.48 .ANG.). The obtained diffraction pattern is close to that of tetragonal structures of the .beta.-Sn type (a = 5.3 .ANG. and c/a = 0.5). Nevertheless, the angular distribution of reflections corresponding to the interplanar distance is not in perfect agreement with such a crystallog. system. If it is assumed that the found diffraction pattern represents a superposition of reflections belonging to the .alpha.- and .beta.-phases, then the .beta.-phase structure would be closer to a cubic structure of the FeSi type with a = 5.88 .ANG.. The .beta.-phase was found only at very low degrees of contamination (p < 10-6 mm Hg), but the addn. of small amts. of N had no effect. Upon heating under vacuum at 700-750.degree., the .beta. .fwdarw. .alpha. transition took place, which was accompanied by a drop in the elec. resistance and the appearance of metal-type cond.
CC 70 (Crystallization and Crystal Structure)
Section cross-reference(s): 71

L43 ANSWER 27 OF 27 HCA COPYRIGHT 2002 ACS
39:21860 Original Reference No. 39:3474h-i,3475a-d Properties of ionoplastic Ni. Colombani, Antoine Ann. phys., 19, 272-326 (Unavailable) 1944.
AB cf. C.A. 38, 5460.4. Thin films of Ni were deposited on glass by cathodic **sputtering** in pure H. To obtain reproducible results, the Ni cathode had to be outgassed by induction heating in vacuo, and the app: cleaned by an elec. discharge in H. The **sputtering** voltage was made as low as possible to avoid heating the film and its support during formation. The initial elec. resistance R of a thin deposit increased with time, reaching a stable value after several hrs. at room temp. Addnl. deposits on top of the first showed the same effect. The percentage change in R decreased as the thickness increased, becoming zero above 120 m.mu.. Films below 70 m.mu. obeyed Ohm's law only at fields above 9 v./cm. Passage of an elec. discharge above the film decreased R, but this

change reversed itself on standing. When the films were heated and maintained at a const. elevated temp. T1, R changed irreversibly, and reached a const. value only after many days. The films then showed a reversible change of R with temp. below T1, but any increase above T1 produced a new irreversible change, and again many days at the new higher temp. were required for R to become const. Above 360.degree. little or no further change occurred. With films of thickness above **220** m.mu., the final value of R decreased with increasing annealing temp. until at 310.degree. R was about half the initial value; at higher temps. the direction of change abruptly reversed, and at 360.degree. R was close to its initial room-temp. value. The reversible temp. coeff. a for R below the annealing temp. decreased as the annealing temp. increased to 310.degree., but between 310.degree. and 360.degree. a was const. X-ray diffraction showed all films to be amorphous before annealing. After 5 months' annealing at 410.degree., films of thickness below **220** m.mu. were still amorphous, those between **220** and 360 m.mu. showed hexagonal structure, and those above 360 m.mu. showed the ordinary **face-centered cubic** structure of Ni. Microscopic examn. showed crystals formed in the annealing of the originally homogeneous thick films. The atoms are believed to form initially 2-dimensional layers which in the thicker films become oriented on annealing. For elec. properties of annealed films as a function of thickness, see C.A. 38, 4847.6. The amorphous films are very reactive, R was increased 20-fold by exposure to a trace of moist air; but the cryst. annealed films showed an increase of only a few % in R by moist air. The magnetic permeability of the films was measured in vacuo by an induction method. Only those annealed deposits which possessed the normal **face-centered cubic** structure were appreciably ferromagnetic.

CC 2 (General and Physical Chemistry)

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L44 ANSWER 1 OF 8 HCA COPYRIGHT 2002 ACS

135:130160 Carbon-based coatings production by arc plasma. Devia C, A.; Arango, P.; Botero, J.; Arroyave, M.; Restrepo, E.; Garcia, L.; Pulzara, A.; Arango, Y.; Ramirez, W.; Rivera, W.; Prieto, P. (Laboratorio de Fisica del Plasma Universidad Nacional de Colombia, Sede Manizales, Colombia). AIP Conf. Proc., 563(Plasma Physics), 73-77 (English) 2001. CODEN: APCPCS. ISSN: 0094-243X. Publisher: American Institute of Physics.

AB Carbon-based coatings were produced by arc plasma for **phys. vapor deposition** starting from HOPG (High Oriented Pyrolitic Graphite) **target**. The coatings were deposited on substrates of silicon (100) and (**110**) at 46.degree.C. XRD spectra and AFM images were taken on samples, further the plasma was characterized by OES. The low temp. of deposition process allows its use in a wide range of applications.

CC 76-3 (Electric Phenomena)

L44 ANSWER 2 OF 8 HCA COPYRIGHT 2002 ACS
132:101290 Low-energy Ar+ ion induced angularly resolved Al(100) and Al(**110**) sputtering measurements. Smith, P. C.; Ruzic, D. N. (Department of Nuclear, Plasma and Radiol. Eng., University of Illinois at Urbana-Campaign, Urbana, IL, 61801, USA). J. Vac. Sci. Technol., A, 17(6), 3443-3448 (English) 1999. CODEN: JVTAD6. ISSN: 0734-2101. Publisher: American Institute of Physics.
AB An app. and anal. method to obtain both the angular distribution of sputtered atoms and the total sputtering yield for materials of interest to **phys**. **vapor deposition** (**PVD**) was created. Total yield is detd. by **collecting** the sputtered material on a quartz crystal oscillator (QCO) microbalance. The sputtered material is also **collected** on a pyrolytic graphite witness plate. By mapping the concns. of the sputtered material on this plate, both polar and azimuthal angular distributions of the sputtered material can be detd. Utilizing this setup, data were obtained for (200-500 eV) Ar+ normally incident on polycryst. Al sputtering **targets** with strong (100) and (**110**) crystallog. orientations. The overall yields of these samples compare well to the available data as well as empirical formulas. Crystallog. effects in the angular distributions are clearly seen. The Al(100) sample shows 12% enhanced sputtering along the .ltbbrac.**110**.rtbbrac. direction at all energies.
CC 76-11 (Electric Phenomena)
Section cross-reference(s): 75
IT Crystal orientation
Sputtering
(low-energy Ar+ ion induced angularly resolved Al(100) and Al(**110**) sputtering measurements)
IT **Vapor deposition** process
(**phys**.; low-energy Ar+ ion induced angularly resolved Al(100) and Al(**110**) sputtering measurements applicable to)
IT 14791-69-6, Argon1+, processes
(low-energy Ar+ ion induced angularly resolved Al(100) and Al(**110**) sputtering measurements)
IT 7429-90-5, Aluminum, properties
(low-energy Ar+ ion induced angularly resolved Al(100) and Al(**110**) sputtering measurements)

L44 ANSWER 3 OF 8 HCA COPYRIGHT 2002 ACS
131:190110 Hyperthermal vapor deposition of copper: athermal and biased diffusion effects. Zhou, X. W.; Wadley, H. N. G. (Department of Materials Science and Engineering, School of Engineering and Applied Science, University of Virginia, Charlottesville, VA, 22903, USA). Surf. Sci., 431(1-3), 42-57 (English) 1999. CODEN: SUSCAS. ISSN: 0039-6028. Publisher: Elsevier Science B.V..
AB The kinetic energy of an adatom during its **impact** with a growth surface significantly affects the morphol. and microstructure

of vapor-deposited films and coatings. At.-scale reconstruction processes including athermal and biased diffusion are in part responsible. A 3-dimensional mol. dynamics method was used to characterize the extent of these diffusional processes following hyperthermal adatom **impacts**. Athermal diffusion results from a significant transient increase in effective temp. near the **impact** site due to the partitioning of the latent heat of condensation and the adatom's incident kinetic energy amongst the vibrational modes of the lattice. The diffusion induced by this mechanism is more or less independent of the substrate temp. Simulations of oblique hyperthermal deposition indicated that adatoms can overcome surface potential-energy barriers without thermal activation and sometimes skip large distances over the substrate surface. This results in significant forward-directed biased diffusion. The dependence of the transient heating (responsible for athermal diffusion) and the biased diffusion distance upon the adatom's incident energy and angle were detd. for the {100}, {**110**} and {111} surfaces of Cu and fitted to simple relations that are convenient for use in atomistic deposition models.

CC 66-3 (Surface Chemistry and Colloids)
Section cross-reference(s): 56

IT **Vapor deposition** process
(**phys**.; athermal and biased diffusion effects on hyperthermal vapor deposition of copper)

L44 ANSWER 4 OF 8 HCA COPYRIGHT 2002 ACS

131:160238 Atomic-scale effects of sub-keV ions during growth and subsequent ion-beam analysis of molybdenum thin films. Klaver, Peter; Haddeman, Edwin; Thijsse, Barend (Laboratory of Materials Science, Center for Research on Ion-Solid Interactions and Surfaces (CRISIS), Delft University of Technology, Delft, 2628 AL, Neth.). Nucl. Instrum. Methods Phys. Res., Sect. B, 153(1-4), 228-235 (English) 1999. CODEN: NIMBEU. ISSN: 0168-583X. Publisher: Elsevier Science B.V..

AB Mol. dynamics simulations were performed to study the growth of electron-beam evapd. molybdenum (100) and (**110**) films with and without Ar+ ion assistance, as well as the effects that take place on subsequent irradn. by low-energy He+ ions. The results are compared with corresponding exptl. results from thermal He desorption spectrometry and other techniques, and at.-level information is obtained on mechanisms governing film morphol., ion trapping and defect dynamics. We find that the majority of the simulation results agree with the expts., but we also show certain limitations of the computational methods applied, esp. in cases where long-term thermal processes on the surface are the only driving forces for film evolution. An interesting obsd. phenomenon is stress-induced vacancy attraction.

CC 56-6 (Nonferrous Metals and Alloys)

ST ion beam assisted **PVD** molybdenum film roughness; electron beam evapn deposition ion assisted

IT Ion **bombardment**

(at.-scale effects of sub-keV Ar ions during growth and subsequent He ion-beam anal. of Mo thin films)

L44 ANSWER 5 OF 8 HCA COPYRIGHT 2002 ACS
131:47780 Molybdenum deposition on TiO2 (**110**) surfaces with different stoichiometries. Petigny, S.; Domenichini, B.; Mostefa-Sba, H.; Lesniewska, E.; Steinbrunn, A.; Bourgeois, S. (Laboratoire de Recherches ssur la Reactivite des Solides, UMR 5613 CNRS-Universite de Bourgogne, Dijon, 21011, Fr.). Appl. Surf. Sci., 142(1-4), 114-119 (English) 1999. CODEN: ASUSEE. ISSN: 0169-4332. Publisher: Elsevier Science B.V..

AB The deposition of ultra thin Mo films has been carried out on 3 different TiO2 surfaces: a stoichiometric and flat one obtained after annealing, a non stoichiometric and rough surface made by Ar+ **bombardment**, and a stoichiometric and rough surface obtained by O **bombardment**. Whatever the substrate prepn., in situ AES and XPS studies and ex situ AFM and RHEED characterizations have revealed a Stranski-Krastanov growth mode: the completion of 3 monolayers followed by island growth is obsd. in any case. The 3 monolayers are composed of amorphous Mo oxide with a Mo oxidn. state between III and IV. The oxidn. of the Mo layers generates a redn. of the substrate with the formation of Ti3+ and Ti2+ and induces a reconstruction of the surface: during the formation of the Mo oxide layers, the roughness of the surface strongly decreases. After the growth of the 3 layers, the surface is flat whatever the initial roughness. Then, the Mo atoms can diffuse on the surface and generate clusters. The resulting islands are metallic (bcc.) but without preferential orientation.

CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 57

ST molybdenum **phys vapor deposition** oxidn titania substrate

IT Interfacial structure
Surface roughness
(amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

IT Oxidation
(of molybdenum; amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

IT Reduction
(of titania surface layer; amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

IT **Vapor deposition** process
(**phys**.; amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

IT Ceramics
(titania; amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different

stoichiometries)

IT 11098-99-0, Molybdenum oxide
(amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

IT 7439-98-7, Molybdenum, processes 13463-67-7, Titania, processes
(amorphous oxide film and bcc. island formation during Mo deposition on TiO2 (**110**) surfaces with different stoichiometries)

L44 ANSWER 6 OF 8 HCA COPYRIGHT 2002 ACS

124:349381 Deposition of Mo films by ion beam assisted excimer laser **PVD** method. Yano, Tetsuo; Ooie, Toshihiko; Yoneda, Masafumi; Katsumura, Munehide (Shikoku National Industrial Research Institute, AIST, Takamatsu, 761-03, Japan). Laser Inst. Am. [Publ.], 80(Proceedings of the Laser Materials Processing Conference, ICALEO 95, 1995), 251-259 (English) 1995. CODEN: LIAAED.

AB The effect of ion beam irradn. on the adhesion strength of Mo films was examd. using an ion beam assisted excimer laser **PVD** app. We also examd. the effect of energy d., **target** -substrate distances, and **target** rotation on the surface morphol. Spectroscopic diagnosis for a Mo plume was performed. The adhesion of the Mo film was improved by ion beam irradn. which removes a thin surface layer of the substrate. Smooth surface Mo films without droplets were successfully formed under laser fluence conditions of less than 0.25MJ/m2, a **target**-substrate distance greater than 40 mm, and with **target** rotation. Mo films with a b.c.c. structure show the (**110**) preferred orientation of <**110**>. The Mo plume generated by laser ablation is in an excited state contg. Mo+.

CC 56-6 (Nonferrous Metals and Alloys)

ST molybdenum film laser **PVD**

IT Laser radiation
Vapor deposition processes
(deposition of Mo films by ion beam assisted excimer laser **PVD** method)

IT 7439-98-7, Molybdenum, processes
(deposition of Mo films by ion beam assisted excimer laser **PVD** method)

L44 ANSWER 7 OF 8 HCA COPYRIGHT 2002 ACS

122:139650 Deposition of Mo films by an ion beam assisted excimer laser **PVD** method. Yano, Tetsuo; Ooie, Toshihiko; Yoneda, Masafumi; Katsumura, Munedhide (Shikoku National Industrial Res. Inst., AIST, Takamatsu, Japan). Nippon Kinzoku Gakkaishi, 58(12), 1429-35 (Japanese) 1994. CODEN: NIKGAV. ISSN: 0021-4876.

AB Mo films were deposited by using an excimer laser ablation method under different conditions of laser fluence and **target** -substrate distance. The surface morphol. was obsd. by using SEM. Adhesion of the Mo films deposited on the substrate with ion beam preirradn. was examd. Spectroscopy of the Mo plume was carried out.

Adhesion of the Mo films was increased by ion beam irradn. which removes a thin surface layer on the substrate. A smooth surface on the Mo films without droplets was formed under the conditions of laser fluence <0.25 MJ/m2, **target**-substrate distance >40 mm, and **target** rotation. Bcc. Mo films had a (**110**
) preferred orientation of .ltbbrac.**110**.rtbbrac.. The Mo plume generated by laser ablation was in an excited state contg. Mo+.

CC 56-6 (Nonferrous Metals and Alloys)

ST molybdenum film ion assisted **PVD**

IT Vapor deposition processes
(**PVD**; molybdenum films by ion beam-assisted laser)

IT 7439-98-7, Molybdenum, processes
(molybdenum films by ion beam-assisted laser **PVD**)

L44 ANSWER 8 OF 8 HCA COPYRIGHT 2002 ACS

121:234598 Solar cell structures combining amorphous, microcrystalline, and single-crystalline silicon. Tsuo, Y.S.; Wu, X.; Alleman, J.L.; Li, X.; Qu, Y.; Ciszek, T.F.; Hollingsworth, R.E.; Bhat, P.K. (National Renewable Energy Laboratory, Golden, CO, 80401-3393, USA). Conf. Rec. IEEE Photovoltaic Spec. Conf., 23rd 281-6 (English) 1993. CODEN: CRCNDP. ISSN: 0160-8371.

AB Single- or multiple-junction solar cells combining hydrogenated amorphous silicon (a-Si:H) and/or microcryst. silicon (.mu.c-Si) thin films with a single-cryst. silicon (c-Si) or polycryst. silicon (poly-Si) substrate have potential for high efficiency and long-term stability. The processing temps. for such cells need not exceed 250.degree. and, except for the Si substrate, only chem. and **phys. vapor depositions** are used for
cell fabrication. We are studying two cell structures: single-junction with the structure of p-type .mu.c-Si/p-type a-Si:H/n-type c-Si and two-junction with the structure of n-i-p a-SiC:H/n+-p c-Si. In addn. to developing solar cells with more efficient light **collection**, a potential benefit of the multiple-junction cell research is the development of stable, high-efficiency photoelectrodes with a photovoltage of 1.6 V or higher for direct photoelectrolysis of water for hydrogen prodn. We use a high-frequency (**110** MHz) glow discharge of silane for the depositions of .mu.c-Si and a-Si:H.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

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FILE 'REGISTRY' ENTERED AT 18:05:00 ON 12 MAR 2002

FILE 'HCA' ENTERED AT 18:05:13 ON 12 MAR 2002

L46 26 S L45 AND L9

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L47            26 S L46 AND (L1 OR L2)
L48            26 S L47 AND (L3 OR L4)
L49            26 S L47 AND (L5 OR L28 OR L34)
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L49 ANSWER 1 OF 26 HCA COPYRIGHT 2002 ACS

135:80539 Mechanical properties of nanostructured Cr-B films produced by RF **sputtering**. Mori, Masakazu; Shibayanagi, Toshiya; Maeda, Masakatsu; Naka, Masaaki (Japan). Trans. JWRI, 29(2), 31-36 (English) 2000. CODEN: TRJWD2. ISSN: 0387-4508. Publisher: Osaka University, Joining and Welding Research Institute.

AB Much attention has been focused on nanostructured materials and some novel properties such as inverse Hall-Petch effect have been reported so far, although little information concerning thermal stability at high temp. has been obtained for nanostructured super-satd. solid solns. The objectives of this paper are to come to a basic understanding of these characteristics in nanostructured Cr-B alloys thin foils. The magnetron RF **sputtering** method was utilized to produce Cr-B alloy thin foils ranging 10 to 20 .mu. m in thickness using a pure Cr (99.9mass%) **target** and pure B (99.9 mass%) pieces added to it to change compn. The base pressure was below 2.0 .times. 10-5 Pa, and the Ar gas pressure for **sputtering** was 0.8Pa. Microstructural evaluation was performed utilizing XRD, EPMA and TEM techniques. **Grain size** was measured by XRD peak anal. using the Scherrer equation as well as TEM observation. Mech. properties were evaluated with micro-hardness tests at room temp. XRD anal. revealed that the alloys showed cryst. states up to 9.0 at% B and an amorphous phase appeared beyond this content. The cryst. specimens decreased **grain sizes** from 40 to 9 nm as B content increased, and a strong (**110**) **texture** appeared regardless of the content. Microhardness of the specimen increased with the solute content up to 5 at% and showed max. values of 20.5GP which decreased for further contents. As **grain size** also changes with B content, so nano-size effect may have an dominant role in the range of B content from 5.0 to 9.0 at% in this alloy where the **grain size** is less than 50 nm.

CC 56-12 (Nonferrous Metals and Alloys)

ST microhardness **grain size** nanostructure chromium boride thin film **sputtering**

IT Films
Foils
Grain size
Microhardness
Microstructure
(mech. properties of nanostructured Cr-B alloy foils produced by RF **sputtering**)

IT 138462-62-1 347148-38-3 347148-41-8
(mech. properties of nanostructured Cr-B alloy foils produced by

RF **sputtering**)

L49 ANSWER 2 OF 26 HCA COPYRIGHT 2002 ACS
134:360442 Crystallographic and magnetic properties of CoCrPt/Cr films produced by pulsed laser deposition. Shima, M.; Ford, A. C.; Ross, C. A. (Department of Materials Science and Engineering, Massachusetts Institute of Technology, Cambridge, MA, 02139, USA). IEEE Trans. Magn., 36(5, Pt. 1), 2321-2323 (English) 2000. CODEN: IEMGAQ. ISSN: 0018-9464. Publisher: Institute of Electrical and Electronics Engineers.

AB The crystallog. structure and magnetic properties of CoCrPt(30 nm)/Cr(50 nm) films fabricated by pulsed laser deposition were studied at various substrate temps. and ion **bombardment** energies. Cr(002) **texture** is developed at 350-500.degree. where increased coercivity is obsd. from the Co-alloy layers, while Cr(**110**) **texture** is formed at 300.degree.. The av. **grain size** of the Cr layers gradually increases with substrate temp. from .apprxeq.10-20 nm, which is comparable to that of **sputtered** films. A Cr(002) x-ray peak is not obsd. from films grown at 400.degree. with Ar ion **bombardment** (>50 eV). The coercivity and squareness of the magnetic hysteresis loops decrease as the beam energy increases, which may be attributed to the absence of Cr(002) **texture**.

CC 77-1 (Magnetic Phenomena)
Section cross-reference(s): 56, 75

ST chromium cobalt platinum magnetic recording medium **texture** coercivity; laser deposition chromium cobalt platinum magnetic recording medium

IT Vapor deposition process
(laser ablation; **texture** and magnetic properties of CoCrPt/Cr films produced by pulsed laser deposition)

IT Coercive force (magnetic)
Grain size
Magnetic hysteresis
Magnetic recording materials
Texture (metallographic)
(**texture** and magnetic properties of CoCrPt/Cr films produced by pulsed laser deposition)

IT 7440-47-3, Chromium, properties 91033-96-4
(**texture** and magnetic properties of CoCrPt/Cr films produced by pulsed laser deposition)

L49 ANSWER 3 OF 26 HCA COPYRIGHT 2002 ACS
134:151148 Recent progress in large scale manufacturing of multilayer/superlattice hard coatings. Hovsepian, P. E.; Lewis, D. B.; Munz, W.-D. (Materials Research Institute, Sheffield Hallam University, Sheffield, S1 1WB, UK). Surface and Coatings Technology, 133-134, 166-175 (English) 2000. CODEN: SCTEEJ. ISSN: 0257-8972. Publisher: Elsevier Science S.A..

AB A review with 41 refs. Since the early fundamental research on superlattice structured hard coatings in the late 1980s, rapid progress has been achieved to produce nanoscale compositionally

modulated multilayer structures. It has been shown that the periodicity of the multilayers is strongly controlled by the substrate rotation and the actual deposition rate. Appropriate multi-**target** geometry and controlled **target** poisoning by optimized pumping conditions lead to deposition conditions similar in their economy to the deposition of typical monolithically grown binary hard coatings. The combined steered cathodic arc/unbalanced magnetron technol. guaranties sufficient adhesion (LC>50 N) of the usually highly stressed coatings as well as smooth surfaces due to UBM deposition (Ra<0.04 .mu.m). This paper surveys the properties of coatings dedicated to high temp. performance: TiAlN/CrN (period 3.03 nm), to tribol. applications: TiAlYN/VN (period 3.62 nm) and combined wear and corrosion resistance CrN/NbN (period 3.2 nm). All the coatings investigated were found to crystallize into B1 NaCl **f.c.**
c. structures, and exhibited {**110**} and {111} or {100} preferred orientations for TiAlN/CrN, TiAlYN/VN and CrN/NbN superlattice coatings, resp. The residual stress was compressive in the range -4.0 to -8.5 GPa for TiAlYN/VN and between -1.8 and -7.5 GPa for CrN/NbN, depending on the stoichiometry and the bias voltage during coating deposition. Corresponding to the high stress values, plastic hardness of the coatings was 55-60 GPa for TiAlN/CrN, 42-78 GPa for TiAlYN/VN and 42-56 GPa for CrN/NbN systems, depending on the bias voltage. Oxidn. resistance at temps. exceeding 900.degree.C was typical for TiAlN/CrN. The TiAlYN/VN coating showed superior tribol. properties with a coeff. of friction .mu. = 0.4 and low sliding wear of 1.26.times.10-17 m2.N-1 after 1.1 million cycles against an Al2O3 ball in a pin-on-disk test. CrN/NbN exhibited two orders of magnitude lower passive current densities than electroplated hard Cr and a pitting potential of 450 mV during polarization in acetate buffer soln. When Nb+ ion etching was used, the CrN/NbN superlattice coating deposited on 304L stainless steel showed high pitting potentials in the range of 750-1000 mV in the same corrosive medium.

CC 57-0 (Ceramics)

IT Magnetron **sputtering**
(steered cathodic arc/unbalanced; large-scale manufg. and properties of multilayer/superlattice hard nitride coatings)

L49 ANSWER 4 OF 26 HCA COPYRIGHT 2002 ACS

134:59814 Initial growth characteristic of Ni-Cu films deposited on MgO(0 0 1) by DC-biased plasma **sputtering**. Qiu, Hong; Hashimoto, Mituru (Department of Applied Physics and Chemistry, University of Electro-Communications, Tokyo, 182-8585, Japan). Vacuum, 59(2-3), 411-416 (English) 2000. CODEN: VACUAV. ISSN: 0042-207X. Publisher: Elsevier Science Ltd..

AB Ni100-xCux films (x = 8-3) with island structure were prepd. on MgO(0 0 1) substrate at 230.degree.C by DC-biased plasma **sputtering** in pure Ar gas using an Ni90Cu10 alloy **target**. A DC-bias voltage Vs of 0, - **110** or - 140 V was applied to the substrate during deposition. The growth structure of the films was investigated as a function of Vs by using

transmission electron microscopy. The Ni100-xCux films have normally an island structure with the **fcc** lattice of the components where x changes from 8 to 3 as Vs changes from 0 to - 140 V. When Vs = 0 and - 140 V, the films are epitaxially grown with Ni-Cu(0 0 1)[0 1 0]MgO (0 0 1)[0 1 0], incorporating misfit dislocations inside the islands due to 16% lattice misfit between Ni100-xCux (x = 8-3) and MgO. In contrast, when Vs = - **110** V, the film is composed of polycryst. islands. In conclusion, whether or not the film is epitaxially grown can be interpreted in terms of a competition between an increase in deposition rate and a decrease in epitaxial temp., both of which are caused by applying Vs.

CC 56-6 (Nonferrous Metals and Alloys)
Section cross-reference(s): 57, 75

ST epitaxial growth nickel copper film magnesia plasma **sputtering**

IT Epitaxial films
Epitaxy
Microstructure
Misfit dislocations
Sputtering
(initial growth characteristic of Ni-Cu films deposited on MgO (001) by d.c.-biased plasma **sputtering**)

IT 55929-95-8P, Copper 3, nickel 97 (atomic) 313996-95-1P
(initial growth characteristic of Ni-Cu films deposited on MgO (001) by d.c.-biased plasma **sputtering**)

IT 1309-48-4, Magnesia, uses
(initial growth characteristic of Ni-Cu films deposited on MgO (001) by d.c.-biased plasma **sputtering**)

IT 12644-01-8, Copper 10, nickel 90 (atomic)
(**target**; initial growth characteristic of Ni-Cu films deposited on MgO (001) by d.c.-biased plasma **sputtering**
)

L49 ANSWER 5 OF 26 HCA COPYRIGHT 2002 ACS

131:313273 Synthesis and characterization of Ti-Si-C-N films. Shtansky, D. V.; Levashov, E. A.; Sheveiko, A. N.; Moore, J. J. (SHS Center, Moscow Steel and Alloys Institute, Moscow, 107005, Russia). Metall. Mater. Trans. A, 30A(9), 2439-2447 (English) 1999. CODEN: MMTAEB. ISSN: 1073-5623. Publisher: Minerals, Metals & Materials Society.

AB Multicomponent thin films were deposited by magnetron **sputtering** of multiphase composite **targets**. Films of Ti-Si-C-N were synthesized by d.c. magnetron **sputtering** of xTiC + yTi3SiC2 + zA composite **targets** (A is TiSi2 and/or SiC) in an Ar atm. or in an Ar-N mixt. The as-deposited films were characterized using AES, x-ray diffraction, TEM using selected area electron diffraction and high-resoln. techniques, and microhardness. The substrate temp. and N concn. in the reactive gas had a strong influence on the microstructure and compn. of the as-deposited films. The films deposited from the Si-poor **targets** were either polycryst. or contained a mixt. of nanocryst. and amorphous phases. An amorphous phase formed as

individual grains rather than as intergrain amorphous layers. All films deposited from the Si-rich **target** were amorphous in nature. Particular attention has been paid to the at. structure of grains and grain boundaries in the cryst. films. Polycryst. grains contained a high d. of dislocations and exhibited a curved appearance of the lattice fringes probably due to the long-range stress fields. The measurements of the lattice parameters using the selected area electron diffraction pattern method indicated, with a high probability, that the polycryst. grains consist of clusters of atoms with varying compns. The grain boundaries in the nanocryst. Ti-Si-C-N films had both ordered and disordered regions, although some regions close to the interface exhibited neither a fully cryst. nor a homogeneously amorphous structure. The at. structure of an interface depended on the orientation relationship between adjacent grains. The at. planes were perfectly matched when the two grains were oriented close to the [**110**]fcc1//[**110**]fcc2 zone axis. However, the interface dislocations were frequently obsd. at or near the grain boundary when [1101]fcc1//[001]fcc2. The contribution of compressive stress as detd. by an increase in the **fcc**. lattice parameter is also discussed.

CC 57-2 (Ceramics)

ST titanium carbide nitride silicide film **sputtering**

IT Films
Magnetron **sputtering**
Microstructure
(synthesis and characterization of Ti-Si-C-N films)

L49 ANSWER 6 OF 26 HCA COPYRIGHT 2002 ACS

131:151848 Growth structure and properties of Fe rich Fe-Ni alloy films deposited on MgO(001) by dc.-biased plasma-**sputtering**.
Yang, Jiping; Barna, Arpad; Makihara, Kenji; Hashimoto, Mituru; Barna, Peter B. (Department of Applied Physics and Chemistry, The University of Electro-Communications, Chofu-shi, Tokyo, 182, Japan). Thin Solid Films, 347(1,2), 85-90 (English) 1999. CODEN: THSFAP. ISSN: 0040-6090. Publisher: Elsevier Science S.A..

AB Ni-Fe alloy films of about 100 nm in thickness were deposited on MgO(001) substrates at 250.degree. by dc. plasma **sputtering** at 2.5 kV in pure Ar gas by applying a Ni0.3Fe0.7 (Invar) or Ni0.2Fe0.8 **target**. A dc. bias voltage Vs between 0 and -180 V was applied to the substrate during deposition. The structure and compn. of the films were investigated by XPS , and by cross sectional transmission electron microscopy (XTEM). The resistance, its temp. coeff. TCR (150 to 300 K) and satn. magnetization 4.pi.Ms at 300 K were measured as a function of Vs. With the use of Ni0.3Fe0.7 **target**, Ni1-xFex films with x between 0.68 .+-. 0.03 and 0.73 .+-. 0.03, can be prepd. where x was weakly dependent on Vs. The film is epitaxially grown mainly with **FCC**-NiFe(001)[010] .dblvert. MgO(001)[010] accompanied with the initial thin layer of about 5 to 10 nm in thickness with BCC-NiFe(001)[**110**] .dblvert. MgO(001)[100] at the interface at Vs values studied. Maximum TCR and min. resistance are obsd. between Vs = -120 to -160 V. 4.pi.Ms takes greater value at

Vs .gtoreq. 120 V. In the case of Ni0.2Fe0.8 **target** at Vs = -120 V, Ni1-xFex films with x = 0.80 .+-. 0.03 are entirely grown in a bcc. structure with NiFe(001)[**110**] .dblvert. MgO(001)[100].

CC 75-1 (Crystallography and Liquid Crystals)
Section cross-reference(s): 55, 76, 77

ST plasma **sputter** deposition iron nickel film magnesia; elec resistance iron nickel film plasma **sputtering**; magnetization iron nickel film plasma **sputtering**

IT Bias potential
Electric resistance
Epitaxial films
Epitaxy
Magnetization
Sputtering
(growth structure and properties of Fe rich Fe-Ni alloy films deposited on MgO(001) by dc.-biased plasma-**sputtering**)

IT 11110-41-1P, Iron 68, nickel 32 (atomic) 11148-31-5P 11148-35-9P, Iron 72, nickel 28 (atomic) 11148-38-2P, Iron 71, nickel 29 (atomic) 12640-19-6P, Iron 70, nickel 30 (atomic) 12711-93-2P, Iron 73, nickel 27 (atomic)
(growth structure and properties of Fe rich Fe-Ni alloy films deposited on MgO(001) by dc.-biased plasma-**sputtering**)

IT 1309-48-4, Magnesia, uses
(growth structure and properties of Fe rich Fe-Ni alloy films deposited on MgO(001) by dc.-biased plasma-**sputtering**)

IT 37315-58-5, Iron 80, nickel 20 (atomic)
(**sputter target**; growth structure and properties of Fe rich Fe-Ni alloy films deposited on MgO(001) by dc.-biased plasma-**sputtering**)

L49 ANSWER 7 OF 26 HCA COPYRIGHT 2002 ACS

129:292581 Phase change during the initial of Ni30Fe70 (Invar) films on MgO(001) by d.c.-biased plasma **sputter** deposition. Yang, J. P.; Makihara, K.; Nakai, H.; Shi, J.; Hashimoto, M.; Barna, A.; Barna, P. B. (Department Applied Physics Chemistry, University Electro-Communications, Tokyo, 182, Japan). Mater. Sci. Forum, 287-288(Trends and New Applications of Thin Films), 347-350 (English) 1998. CODEN: MSFOEP. ISSN: 0255-5476. Publisher: Trans Tech Publications Ltd..

AB Ni100-xFex films were deposited m MgO(001) substrates at 250.degree. by d.c. plasmas **sputtering** of the Ni30Fe70 (Invar) **target** at 2.5 kV in pure Ar gas. A d.c. bias voltage Vs from 0 to -180 V ms applied to the substrate during deposition. The film thickness ms controlled by changing the **sputtering** time t from 30 s to 5 min. The initial growth structure and compn. of the films were investigated by XPS and plan-view TEM. The resistance R and its temp. coeff. TCR (150-300 K) were measured as a function of t and of Vs. The Ni100-xFex films where x ranges from 69 .+-. 3 to 71 .+-. 3 weakly dependent on Vs can be prepd. The films are initially grown in a bcc. structure with NiFe(001)||MgO(001) and NiFe[**110**]||MgO[100] when t is 30

s. As t reaches 1 min, the **fcc**. phase appears in the films. When t increases beyond 2 min, the films retain mainly the **fcc**.-NiFe structure with NiFe(001)||MgO(001) and NiFe[100]||MgO[100]. The films are not elec. conductive unless t reaches 2 min, 1 min, and 30 s at Vs = 0, -120, and -180 V, resp. R decreases with an increase in t and in Vs, while TCR changes consistently with the change of R.

CC 56-8 (Nonferrous Metals and Alloys)
Section cross-reference(s): 75, 76

ST nickel iron **sputter** deposition structural transition; elec resistance Invar structural transition **sputtering**

IT Electric resistance
Sputter deposition
Structural phase transition
(bcc. .fwdarw. **fcc**. structural transition and change in elec. resistance in Ni100-xFex films **sputter**-deposited from Invar)

IT 214215-71-1, Iron 29-31, nickel 69-71 (atomic)
(bcc. .fwdarw. **fcc**. structural transition and change in elec. resistance in Ni100-xFex films **sputter**-deposited from Invar)

L49 ANSWER 8 OF 26 HCA COPYRIGHT 2002 ACS

128:302491 Structural and electrical properties of Ni-Co films dc-biased plasma-**sputter**-deposited on MgO(001). Ohbuchi, Tatsuya; Ishino, Masaki; Makihara, Kenji; Qiu, Hong; Hashimoto, Mituru; Barna, Arpad; Barna, Peter B. (Department of Applied Physics and Chemistry, The University of Electro-Communications, Chofu-shi, 182, Japan). Thin Solid Films, 312(1,2), 32-36 (English) 1998. CODEN: THSFAP. ISSN: 0040-6090. Publisher: Elsevier Science S.A..

AB Ni-Co alloy films 180-nm thick were deposited on MgO(001) substrates at 280.degree.C by dc plasma-**sputtering** at 2.5 kV in pure Ar gas using a Ni90Co10 **target**. A bias voltage, Vs, of 0, -**110**, -140 or -180 V was applied to the substrate during deposition. The structural and elec. properties of the films were studied as a function of Vs by X-ray photon electron spectroscopy, cross-section transmission electron microscopy and by measurements of the temp. coeff. of elec. resistance (TCR), .eta., from 150 to 300 K as well as resistivity, .rho.r, at 10 K. The compn. inside the film is uniformly Ni87Co13 with no detectable impurity independently of Vs. The films retain normally the **fcc**. structure epitaxially grown with the NiCo(001).dblvert.MgO(001) and NiCo[010].dblvert.Mg0[010] relationship. Misfit dislocations are induced at the interface to relax the strain energy due to the lattice mismatch between Ni87Co13 and MgO. In addn., the crystal lattice of the film near the interface is expanded. .eta. Increases and .rho.r decreases by applying Vs, suggesting that the application of Vs could improve the crystallinity of the films.

CC 76-1 (Electric Phenomena)
Section cross-reference(s): 56

ST cobalt nickel film crystal elec property; plasma **sputtering** cobalt nickel alloy

IT Potential energy
(strain; structural and elec. properties of Ni-Co films dc-biased plasma-**sputter**-deposited on MgO(001))
IT Bias potential
Crystal structure
Electric properties
Electric resistance
Misfit dislocations
Sputtering
(structural and elec. properties of Ni-Co films dc-biased plasma-**sputter**-deposited on MgO(001))
IT 11101-13-6P 12619-17-9P, Cobalt 10, nickel 90 (atomic)
73990-58-6P, Cobalt 13, nickel 87 (atomic)
(structural and elec. properties of Ni-Co films dc-biased plasma-**sputter**-deposited on MgO(001))

L49 ANSWER 9 OF 26 HCA COPYRIGHT 2002 ACS
128:78341 Turnover of **texture** in low rate **sputter**-deposited nanocrystalline molybdenum films. Drusedau, Tilo P.; Klabunde, Frank; Lohmann, Mirko; Hempel, Thomas; Blasing, Jurgen (Institut fur Experimentelle Physik / Abt. Festkorperphysik der Otto-von-Guericke-Universitat PF 4120, Magdeburg, D - 39016, Germany). Mater. Res. Soc. Symp. Proc., 472(Polycrystalline Thin Films--Structure, Texture, Properties and Applications III), 33-38 (English) 1997. CODEN: MRSPDH. ISSN: 0272-9172. Publisher: Materials Research Society.
AB The crystallite size and orientation of molybdenum films prepd. by magnetron **sputtering** at a low rate of 1 .ANG./s and pressure of 0.45 Pa was investigated by using x-ray diffraction and **texture** anal. The surface topog. was studied by using at. force microscopy. By increasing the film thickness from 20 nm to 3 .mu.m, the films show a turnover from a (**110**) fiber **texture** to a (211) mosaic-like **texture**. In the early state of growth from 20 nm, the development of dome-like structures on the surface was obsd. The no. of these structures increases with increasing film thickness, whereas their size is weakly influenced. The effect of **texture** turnover is reduced by increasing the deposition rate by a factor of six, and it is absent for specimens mounted above the center of the magnetron source. The effect of **texture** turnover is related to the **bombardment** of the films with high energetic Ar neutrals resulting from backscattering at the **target** at an oblique angle and causing resputtering. Due to the narrow angular distribution of the reflected Ar, **bombardment** of the substrate plane is inhomogeneous and only significant for regions close to the erosion zone of the magnetron.
CC 56-6 (Nonferrous Metals and Alloys)
ST **texture** effect nanocryst molybdenum film; **grain size** nanocryst molybdenum film
IT Crystallite size
Films
Texture (metallographic)

(turnover of **texture** in low rate **sputter** -deposited nanocryst. molybdenum films)
IT Nanocrystalline metals
(turnover of **texture** in low rate **sputter** -deposited nanocryst. molybdenum films)
IT 7439-98-7, Molybdenum, properties
(turnover of **texture** in low rate **sputter** -deposited nanocryst. molybdenum films)

L49 ANSWER 10 OF 26 HCA COPYRIGHT 2002 ACS
126:160977 Morphology, structure, and constitution of metastable single-phase Ti1-xAlxN films grown by reactive MSIP. Von Richthofen, Alexander; Cremer, Rainer; Neuschuetz, Dieter (Rheinisch-Westfaelische Technische Hochschule, Aachen, D-52056, Germany). Mikrochim. Acta, 125(1-4), 143-148 (English) 1997. CODEN: MIACAQ. ISSN: 0026-3672. Publisher: Springer.
AB Metastable, single-phase, polycryst. Ti1-xAlxN hard layers were deposited on HSS-substrates with reactive magnetron **sputtering** ion plating (MSIP). The substrate temp. was 400.degree., the bias -60 V, the argon pressure 1.2 Pa, and the **sputter** power 6 W cm-2. Compd. **targets** with a Ti:Al ratio of 75/25, 50/50 and 25/75 (at%) were **sputtered** . The nitrogen reactive gas pressure during **sputtering** was 8.4 .times. 10-2 Pa for the 75:25 **target** and 1.08 .times. 10-1 Pa for the 50:50 and 25:75 **targets**. The Ti1-xAlxN layers grew with .times. = 0.26, 0.54 and 0.75, resp., as detd. with EPMA. Thin film XRD and HEED structure anal. showed that the Ti0.74Al0.26N layer had B1 structure (a0:0.4214 nm) with [211] **texture**; the Ti0.46Al0.54N layer had B1 structure (a0:0.4154) with [111] **texture**; Ti0.25Al0.75N had B4 structure (a0:0.317 nm and c0:0.5014 nm) with [**110**] **texture**. Pronounced columnar growth was obsd. with HR-SEM in the fractured surface of the cubic layers. The mean **grain size**, and consequently the surface roughness, diminished with increasing Al-content of the layer.
CC 57-7 (Ceramics)
ST titanium aluminum nitride coating ion plating; **sputtering** titanium aluminum nitride coating property
IT Coatings
(aluminum titanium nitride; properties of Ti1-xAlxN films prepd. by reactive magnetron **sputtering** ion plating from Ti-Al alloy **targets**)
IT Crystal orientation
Reactive **sputtering**
(properties of Ti1-xAlxN films prepd. by reactive magnetron **sputtering** ion plating from Ti-Al alloy **targets**)
IT 106389-69-9P, Aluminum titanium nitride (al,ti)n 144047-85-8P, Aluminum titanium nitride al0.75ti0.25n 157043-68-0P, Aluminum titanium nitride al0.54ti0.46n
(coatings; properties of Ti1-xAlxN films prepd. by reactive magnetron **sputtering** ion plating from Ti-Al alloy

targets)

IT 12633-53-3, Aluminum 25, titanium 75 (atomic) 53550-31-5, Aluminum 50, titanium 50 (atomic) 110633-84-6, Aluminum 75, titanium 25 (atomic)
(**target**; properties of Ti1-xAlxN films prepd. by reactive magnetron **sputtering** ion plating from Ti-Al alloy **targets**)

L49 ANSWER 11 OF 26 HCA COPYRIGHT 2002 ACS
126:78302 Structural and electrical properties of Ni-Cu films deposited onto MgO(001) by d.c. biased plasma **sputter** deposition.
Qiu, H.; Hashimoto, M.; Barna, A.; Barna, P. B. (Department Applied Physics Chemistry, University Electro-Communications, Tokyo, 182, Japan). Thin Solid Films, 288(1-2), 171-175 (English) 1996. CODEN: THSFAP. ISSN: 0040-6090. Publisher: Elsevier.
AB Ni-Cu alloy films were deposited onto Mg0(001) substrates at 230 .degree.C by d.c. plasma **sputtering** at 2.7 kV and 8 mA in pure Ar gas using an Ni-10wt.%Cu alloy **target**. The deposition time was 15 or 30 min. A d.c. bias voltage Vs ranging from 0 to -140 V was applied to the substrate during deposition. The structure, compn. and elec. properties of the films were studied as a function of Vs using cross-sectional transmission electron microscopy (XTEM) and XPS (XPS), and measurements of the temp. coeff. of elec. resistance (TCR) from - 135 to - 15 .degree.C. The alloy films, which have the **f.c.c.** lattice of the components, are monocryst. with the relationship Ni-CU(001) .dblvert.MgO(001) and Ni-Cu[010] .dblvert.MgO[010] unless Vsp=-**110** V. The Cu content in the films decreases from 8 wt.% to 3 wt.% as Vs increased from 0 to -140 V. The growth rate of the films and the value of TCR .eta. (.eta.>0) depend on Vs; the film thickness d for the films deposited for 30 min reaches 50.+-.1 nm at Vs=0 V and 74.+-.2 nm at Vs=-140 V, while .eta. for the films deposited for 30 min increases appreciably with increasing Vs compared with the films deposited for 15 min, although .eta. is highest at Vs=-140 V for both cases.
CC 56-6 (Nonferrous Metals and Alloys)
IT Electric properties
Plasma
Sputtering
(structural and elec. properties of Ni-Cu films deposited onto MgO(001) by d.c. biased plasma **sputter** deposition)
IT 1309-48-4, Magnesia, processes 11101-28-3
(structural and elec. properties of Ni-Cu films deposited onto MgO(001) by d.c. biased plasma **sputter** deposition)

L49 ANSWER 12 OF 26 HCA COPYRIGHT 2002 ACS
125:287528 Structural, compositional and optical characterization of thin TiOxNy coatings fabricated by Dual Ion Beam **Sputtering**
. Rizzo, A.; Mirenghi, L.; Tapfer, L.; Alvisi, M.; Vasanelli, L.; Sarto, F.; Scaglione, S. (Pastis-CNRSM Scpa, Brindisi, Italy). Proc. SPIE-Int. Soc. Opt. Eng., 2776(Developments in Optical Component Coatings), 392-399 (English) 1996. CODEN: PSISDG. ISSN:

0277-786X.

AB Ti oxynitride (TiOxNy) thin films are of great interest for the fabrication of protective optical coatings. By varying the O and N content in the films, the elec., optical and mech. properties of these coatings can be tailored properly. The authors fabricated TiN and TiOxNy films (thickness range of 28-**110** nm) by dual ion beam **sputtering** technique (Ti **target**). TiOxNy films were ion-assisted by a low energy (300 eV) O and N mixed ion beam of variable O/N flux ratio (0-1). The incorporation of O greatly improves the adhesion of the film on the glass substrate. Further, the optical extinction coeff. drastically decreases for increasing O content, suggesting new applications of TiOxNy films as protective coatings on transparent substrates. The film compn. by XPS analyses is in agreement with the results obtained by a simple model to describe the ion assistance phenomena. The crystallog. structure of the deposited films was characterized by using .theta.-2.theta. x-ray diffraction and grazing incidence x-ray diffraction measurements. In the range up to 14% of the O to N flux ratio, a TiN **fcc**. phase structure with preferred (111) growth-orientation of the grains is obsd. For higher O concns. the absence of diffraction peaks suggests a more amorphous-like structure of the deposited film. Specular x-ray reflectivity measurements provide important and accurate information about the film-air and film-substrate interface roughness. The Kiessig fringes are caused by multiple internal interference of the x-ray beam and can be obsd. up to 3 degrees (2.theta. angle), which is a clear indication of the high homogeneity of the film thickness and of sharp interfaces.

CC 73-2 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)
Section cross-reference(s): 66

ST titanium nitride oxide ion beam **sputtering**; film optical titanium nitride oxide **sputtering**; reflection optical titanium nitride oxide **sputtering**

IT Absorptivity
Adhesion
Crystal structure
Optical reflection
(structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings fabricated by dual ion beam **sputtering**)

IT Optical materials
(films, structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings fabricated by dual ion beam **sputtering**)

IT **Sputtering**
(ion-beam, structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings fabricated by dual ion beam **sputtering**)

IT Interfacial structure
(roughness, structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings

fabricated by dual ion beam **sputtering**)
IT 7440-37-1, Argon, processes
(structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings fabricated by dual ion beam **sputtering**)
IT 13463-67-7, Titania, properties 25583-20-4, Titanium nitride (TiN) 37271-26-4, Titanium oxynitride
(structural, compositional and optical characterization of thin titanium oxide nitride (TiOxNy) coatings fabricated by dual ion beam **sputtering**)

L49 ANSWER 13 OF 26 HCA COPYRIGHT 2002 ACS
124:191245 Temperature dependence of polar-angle distributions of atoms ejected from ion-**bombarded** Au{111}. Rosencrance, S. W.; Winograd, N.; Garrison, B. J.; Postawa, Z. (Dep. Chem., Pennsylvania State Univ., University Park, PA, 16802, USA). Phys. Rev. B: Condens. Matter, 53(5), 2378-84 (English) 1996. CODEN: PRBMDO. ISSN: 0163-1829.
AB Mol. dynamics simulations incorporating the effect of temp. on the crystal lattice reproduce temp.-dependent changes in the ejection yield obsd. in exptl. obtained angular distributions of species ejected form the Au{111} surface. This effect was only obsd. in **fcc**. {111} surfaces and is preferentially active along the [**110**] direction. The underlying microscopic process responsible for the obsd. temp.-dependent change in the angular spectra is related to the no. of direct ejection events occurring along close-packed crystallog. directions. Approx. 90% of the obsd. decrease in the yield along the [**110**] direction, with increased **target** temp., results predominately from surface quenching with some minor contribution from subsurface misalignment of direct ejection sequence chains. The observations for Au{111} are generalized to predict the temp. dependence of the ejection yield for atoms ejected from low index metal single crystals.
CC 76-12 (Electric Phenomena)
Section cross-reference(s): 56
ST ion **sputtering** gold temp angle distribution
IT Chains, chemical
(in angle distribution of **sputtered** gold)
IT Simulation and Modeling, physicochemical
(temp. dependence of polar-angle distribution of atoms **sputtered** from ion-**bombarded** gold crystal faces)
IT Distribution function
(angular, temp. dependence of polar-angle distribution of atoms **sputtered** from ion-**bombarded** gold crystal faces)
IT **Sputtering**
(ion-beam, temp. dependence of polar-angle distribution of atoms **sputtered** from ion-**bombarded** gold crystal faces)
IT 7440-57-5, Gold, properties
(temp. dependence of polar-angle distribution of atoms

sputtered from ion-**bombarded** gold crystal
faces)

L49 ANSWER 14 OF 26 HCA COPYRIGHT 2002 ACS
116:163061 Magnetron **sputtering targets**. Miyamoto, Takashi (Kobe Steel, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 03243765 A2 19911030 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1990-41448 19900221.
AB The **target** has crystal orientation of low **sputtering** yield preferred-oriented to the direction vertical to the **target** surface. A **target** may be made of Fe, or an alloy of Fe or Ni with the bcc. or **fcc**. structure and .ltoreq.1.0 in reflection intensity of (**110**) or (111) as normalized by isotropic distribution of intensities. The **target** is efficiently used.
IC ICM C23C014-35
CC 75-1 (Crystallography and Liquid Crystals)
ST magnetron **sputtering target** oriented **texture** field
IT **Sputtering**
(app., magnetron, **targets**, field-dependent oriented **texture**)
IT Electric discharge devices
(**sputtering**, magnetron, **targets**, field-dependent oriented **texture**)
IT 11115-28-9, Iron 17, nickel 83 12655-64-0
(magnetron **sputtering target** from)

L49 ANSWER 15 OF 26 HCA COPYRIGHT 2002 ACS
113:83074 Structure of **sputtered** cobalt-chromium-aluminum-yttrium coating. Lou, Hanyi; Wang, Fuhui; Ji, Lirun; Zhang, Lixin (Inst. Corros. Prot. Met., Acad. Sin., Shenyang, 110015, Peop. Rep. China). Jinshu Xuebao, 25(6), B380-B385 (Chinese) 1989. CODEN: CHSPA4. ISSN: 0412-1961.
AB The phase compn. of Co-30Cr-6Al-0.5% Y coating deposited by planar magnetron **sputtering** and the effect of **sputtering** parameters were investigated. The coating is composed of hcp. .epsilon.-phase or **fcc**. .alpha.-phase of Co solid soln. with a minority .beta.-CoAl intermetallic phase. The hcp. .epsilon.-Co phase and the **fcc**. .alpha.-Co phase assumed a .ltbbrac.100.rtbbrac. and .ltbbrac.**110**.rtbbrac. preferred orientation, resp. Both phase type and orientation extent depend on the **sputtering** parameters. If the substrate surface is parallel to the **target** face during **sputtering**, the coating has fine grains and a smooth surface. If the substrate is rotated, the coating has coarse grains and a rough surface.
CC 56-6 (Nonferrous Metals and Alloys)
ST **sputtering** cobalt chromium aluminum yttrium; aluminide cobalt magnetron **sputtering** coating; surface roughness cobalt alloy coating
IT **Sputtering**
(coating by, of cobalt alloy, surface structure in relation to)

IT Surface structure
(roughness, of **sputtered** coatings of cobalt alloy)
IT 12003-14-4P, Cobalt aluminide (CoAl)
(formation of, in cobalt alloy coating, during **sputtering**
)
IT 126998-15-0, K38
(**sputtering** with, surface structure of)

L49 ANSWER 16 OF 26 HCA COPYRIGHT 2002 ACS
112:89897 Growth and control of the microstructure and magnetic properties of **sputtered** neodymium iron boride (Nd2Fe14B) films and multilayers. Aylesworth, K. D.; Zhao, Z. R.; Sellmyer, D. J.; Hadjipanayis, G. C. (Behlen Lab. Phys., Univ. Nebraska, Lincoln, NE, 68588-0111, USA). J. Magn. Magn. Mater., 82(1), 48-56 (English) 1989. CODEN: JMMMDC. ISSN: 0304-8853.
AB The magnetic and structural properties of **sputtered** films of Nd17(Fe0.9Co0.1)76B7 (NFB) and multilayers of NFB with Ag and Fe have been examd. The structure of each film was detd. by small- and large-angle x-ray diffraction, and the magnetic properties were measured in a room-temp. vibrating-sample magnetometer (VSM) with a max. field of 17.1 kOe and cryogenic VSM with a max. field of 80 kOe. The amt. and orientation of the 2:14:1 phase in the samples were found to depend strongly upon the substrate material and degree of **target** oxidn. The primary contaminant in most of the samples studied is a **fcc**. phase with a 5.**110** .ANG., tentatively identified as NdO. The direction of the easy axis of the films can be correlated with the av. c-axis orientation of the 2:14:1 grains, which in turn can be controlled by the application of an external magnetic field during sample annealing and crystn. Nearly single-phase films can be produced with a max. room-temp. coercivity of about 6 kOe and a magnetization of about 100 emu/g. Samples contg. significant amts. of NdO have coercivities up to 10 kOe, but the magnetization then drops to about 40 emu/g. The magnetic properties of the multilayers also depend strongly upon the individual layer thicknesses.
CC 77-1 (Magnetic Phenomena)

L49 ANSWER 17 OF 26 HCA COPYRIGHT 2002 ACS
111:87659 Argon and excess nitrogen incorporation in epitaxial titanium mononitride films grown by reactive bias **sputtering** in mixed argon/nitrogen and pure nitrogen discharges. Hultman, L.; Sundgren, J. E.; Markert, L. C.; Greene, J. E. (Dep. Phys., Linkoeping Univ., Linkoeping, S-58183, Swed.). J. Vac. Sci. Technol., A, 7(3, Pt. 1), 1187-93 (English) 1989. CODEN: JVTAD6. ISSN: 0734-2101.
AB Epitaxial TiN films were grown on (100)-, (**110**)-, and (111)-oriented MgO by reactive magnetron **sputtering** from a Ti **target** in both mixed Ar/N2 and pure N2 discharges. An applied neg. substrate bias Vs (0 .ltoreq. Vs .ltoreq. 600 V) was used to vary the flux and energy of **impinging** Ar+ and/or N2+ ions. The film microstructure was analyzed by TEM and electron channeling and the relative concn. CAr of trapped Ar was measured by

energy-dispersive x-ray anal. For a given value of Vs, CAr initially increased with increasing substrate temp. Ts above the epitaxial temp. Te .apprx.550.degree. due to more efficient Ar channeling as the crystals became better ordered. CAr Reached a max. for all film orientations at Ts .apprx.750.degree. and decreased at higher Ts due to Ar loss by segregation to the surface and desorption. Gas bubbles formed in films deposited at 550 .ltoreq. Ts < 800.degree. and 400 .ltoreq. Vs .ltoreq. 600 V due to pptn. from a supersatn. of implanted Ar and/or N. The most stable shape for pure N2 bubbles was a {100} cube with {**110**} and, to a lesser extent, {111} facets indicative of anisotropy in TiN surface energies. In at least some N2 bubbles, N was present in the **fcc**. solid phase.

CC 75-1 (Crystallography and Liquid Crystals)

ST epitaxy titanium nitride **sputter** gas incorporation; argon trapping titanium nitride VPE

IT **Sputtering**
(reactive, of titanium nitride with bias potential, incorporation of argon and excess nitrogen during)

IT 25583-20-4, Titanium mononitride
(epitaxy of, by reactive bias **sputtering**, argon and excess nitrogen incorporation in)

IT 7440-37-1, Argon, properties 7727-37-9, Nitrogen, properties
(incorporation of, during epitaxy of titanium nitride by reactive bias **sputtering**)

L49 ANSWER 18 OF 26 HCA COPYRIGHT 2002 ACS

108:155269 Growth and characterization of Pb(Zr,Ti)O3 films deposited by reactive **sputtering** of metallic **targets**.
Croteau, Andre; Sayer, Michael (Dep. Phys., Queen's Univ., Kingston, ON, K7L 3N6, Can.). Proc. IEEE Int. Symp. Appl. Ferroelectr., 6th, 606-9. IEEE: Piscataway, N. J. (English) 1986. CODEN: 56FUAM.

AB Ferroelec. Pb zirconate titanate (PZT) thin films were deposited by d.c. reactive **sputtering** of a multi-element metal **target**. The **sputtering** of a metal **target** over an oxide **target** enables control of the stoichiometry of PZT films by adjusting the surface area of Pb, Zr, and Ti at the **target**. The structure of the resulting films without substrate heating was found to be polycryst. with small and strained grains. Larger **grain sizes** (5-20 nm) were obsd. for **sputtered** films at higher pressure and higher substrate temp. Post-deposition annealing resulted in a perovskite structure with a strong (**110**) **texture** and a corresponding **grain size** >100 nm. The films were transparent, with n 2-2.3. The d.c. cond. at 25.degree. was 9.8 .times. 10-11/.OMEGA..cm. PZT films showed an increase in relative permittivity of a factor 3 in terms of temp., thus demonstrating their ferroelec. properties.

CC 57-9 (Ceramics)
Section cross-reference(s): 76

ST ferroelec film reactive **sputtering** deposition; lead zirconate titanate film **sputtering**

IT Dielectric constant and dispersion
Electric conductivity and conduction
(of lead zirconate titanate films, reactive **sputtering** deposition in relation to)

IT **Sputtering**
(reactive, of lead titanate zirconate ferroelec. films, from metal **targets**)

IT 12626-81-2P
(ferroelec. films, prepn. of, by reactive **sputtering** from metal **targets**)

L49 ANSWER 19 OF 26 HCA COPYRIGHT 2002 ACS

99:28550 A model of the surface binding energy for **fcc**. copper-nickel alloy. Reynolds, G. William (State Univ. New York, Albany, NY, 12222, USA). Nucl. Instrum. Methods Phys. Res., 209-210(Pt. 1), 57-61 (English) 1983. CODEN: NIMRD9. ISSN: 0167-5087.

AB An empirical model partitioning the surface binding energy among the 3 sets of nearest neighbors is presented for the **fcc**. lattice. The surface binding energy is detd. for each atom in the surface for the 100, **110**, and 111 surface planes of a small uniform alloy crystal with surface at. fractions attainable by ion implantation of the minor component into a pure elemental **target**. These surface binding energies per atom are summed over the crystal surface and an av. surface binding energy per atom is detd. to ascertain the effect on the partial **sputtering** yields of each component in the alloy layer produced by ion implantation. The partial **sputtering** yield thus calcd. is compared with exptl. data. This model neglects the effect of the modified nuclear stopping power due to ion implantation. The modified av. surface binding energy, as detd. by these calcns., predicts a shift in the partial **sputtering** yields toward the exptl. values. A visual model of the modified energy surface suggests a higher probability for particular atoms to be **sputtered** from the surface leading to more pronounced modification of the av. surface binding energy.

CC 66-5 (Surface Chemistry and Colloids)
Section cross-reference(s): 75

ST surface binding energy alloy; nickel copper alloy binding energy; **sputtering** copper nickel surface binding

IT Surface energy
(of copper-nickel alloy, formed by **sputtering**)

IT **Sputtering**
(ion-beam, of copper or nickel by nickel or copper ions, surface binding energy in relation to)

IT 11102-90-2
(surface binding energy of, formed by **sputtering** with copper ions)

IT 11101-27-2
(surface binding energy of, formed by **sputtering** with nickel ions)

L49 ANSWER 20 OF 26 HCA COPYRIGHT 2002 ACS
93:17619 **Sputtering** and scattering by interaction of low energy noble gas ions with monocrystalline metal surfaces. Van Veen, A. (Rijksuniv. Utrecht, Utrecht, Neth.). Report, INIS-mf-5339, 177 pp. Avail. INIS From: INIS Atomindex 1980, 11(1), Abstr. No. 495566 (English) 1979.
AB **Sputtering** and scattering processes in monocryst. metal surfaces caused by low-energy ion **bombardment** are described. Three aspects of the **sputtering** process were studied: the phenomenon of **sputtering** in preferential directions, the dependence of **sputtering** on the projectile **target** atom mass ratio, and the transition in **sputtering** with increasing projectile energy from being a process dominated by multiple **collisions** in the surface, at the threshold energy, to a process dominated by **collisions** cascades below the surface, at higher energy. The expts. deal with **sputtering** in the low energy region. Ne+, Ar+, Kr+, and Xe+ were perpendicularly incident on **fcc** . (100) and **fcc**. (**110**) Cu, Ag, and Au surfaces. There is a **sputtering** process in which light ions reflecting from sub-surface atoms cause the ejection of surface atoms by **hitting** them from below.
CC 76-4 (Electric Phenomena)
ST **sputtering** noble gas ion metal
IT **Sputtering**
(of noble metal by noble gas ions)
IT Group IB elements
(**sputtering** of, by helium-group gas ions)
IT Helium-group gases, properties
(ions, **sputtering** by, of noble metal)
IT 14782-23-1, properties 14791-69-6, properties 16915-28-9, properties 24203-25-6, properties
(**sputtering** by, of copper, gold and silver)
IT 7440-22-4, properties 7440-50-8, properties 7440-57-5, properties
(**sputtering** of, by helium-group gas ions)

L49 ANSWER 21 OF 26 HCA COPYRIGHT 2002 ACS
70:40700 Cathode **sputtering** of copper, silver and tungsten single crystals in the near threshold region of ion energy. Tishchenko, V. D. (Kiev. Gos. Univ. im. Shevchenko, Kiev, USSR). Radiotekh. Elektron., 13(9), 1642-6 (Russian) 1968. CODEN: RAELA4.
AB The abs. yield of cathodic **sputtering** of Cu, Ag, and W single crystals caused by He+, Ne+, Ar+, Kr+, and Xe+ was investigated in the near threshold region of energies. The quantity of **sputtered** metal was detd. from the increase of radioactivity upon the **collector**; the metals were labeled with 185W, 110Ag, or 65Cu. The (111), (100), and (**110**) faces of **f**.**c**.**c**. Cu and Ag and the (**110**), (100), and (111) faces of b.c.c. W were investigated. The min. energy necessary for **sputtering** decreases with an increase in the ionic mass of the resp. gas. Metals with **f**

.**c**.**c**. lattices display **sputtering**
coeffs. and threshold energy values for different crystal planes
decreasing in the order (111), (100), and (**110**). In the
case of W, the resp. order is (**110**), (100), and (111).
The fine surface structure of the **sputtered** metal is
presumed to involve the effect of the ordered structure of the
crystal **target**.

CC 65 (General Physical Chemistry)

ST copper **sputtering**; silver **sputtering**; tungsten
sputtering; **sputtering** Cu Ag W; noble gases Cu Ag
W **sputtering**

IT Helium-group gases, properties
(cathode **sputtering** by, of metals)

IT Cathode **sputtering**
(of metals by helium-group gas ions)

IT 7440-22-4, properties 7440-33-7, properties 7440-50-8,
properties
(cathode **sputtering** of, by helium-group gas ions)

L49 ANSWER 22 OF 26 HCA COPYRIGHT 2002 ACS

67:57390 **Sputtering** experiments with 1- to 5-kev. argon(I)
ion. II. Monocrystalline **targets** of aluminum, copper,
and gold. Robinson, Mark Tabor; Southern, A. L. (Oak Ridge Natl.
Lab., Oak Ridge, Tenn., USA). J. Appl. Phys., 3,(7), 2969-73
(English) 1967. CODEN: JAPIAU.

AB cf. CA 58: 1977a. **Sputtering** yields were measured during
normally incident 1- to 5-kev. Ar+ ion irradn. of polycryst. Au,
<100>, <**110**>, and <111> Au single-crystals, a <111> Al
single crystal, and several <0kl> Cu crystals of previously
unreported orientations. Onderdelinden's transparency model (CA 65:
9841c) accounts satisfactorily for the orientation dependence of the
yields of low-index Cu, Au, and Ge crystals. The importance of the
recording geometry in governing the appearance of **sputtering**
ejection patterns is demonstrated. The <114> ejection-pattern spots
from <111> **face-centered cubic**
crystals are attributed to assisted focusing sequences along <100>,
the most probable ejection direction being shifted because the last
focusing "lens" is incomplete.

CC 65 (General Physical Chemistry)

ST ARGON **SPUTTERING**; ALUMINUM **SPUTTERING**;
SPUTTERING AR AL CU AU; COPPER **SPUTTERING**; GOLD
SPUTTERING

IT Cathode **sputtering**
(of aluminum, copper and gold with argon (Ar1+) ions, crystal
orientation in relation to)

IT 14791-69-6, properties
(cathode **sputtering** of aluminum, copper and gold with,
crystal orientation in relation to)

IT 7429-90-5, properties 7440-50-8, properties 7440-57-5,
properties
(cathode **sputtering** of, with argon(1+) ions, crystal
orientation and)

L49 ANSWER 23 OF 26 HCA COPYRIGHT 2002 ACS
62:86540 Original Reference No. 62:15442c-d Effect of elevated temperatures on **sputtering** yields. Carlston, C. E.; Magnuson, G. D.; Comeaux, A.; Mahadevan, P. (Gen. Dynamics/Convair, San Diego, CA). Phys. Rev., 138(3A), 759-63 (English) 1965.
AB The effect of elevated temps. on the **sputtering** yields of polycryst. and single-crystal metals was studied at 350-1000.degree.K. The yield detns. were made by standard wt.-loss techniques. The **bombarding** ions were Ar+ with energies 2, 5, and 10 kev. The **face_centered_cubic** polycryst. Cu and Al **targets** showed essentially no change in yield with temp. This is to be contrasted with the polycryst. body-centered-cubic **targets** Mo, W, and Ta which showed linear increases in yield of 26, 28, and 39%, resp. A Mo (100) crystal face showed no change in yield over the temp. range, but a Mo (**110**) face showed a 12% increase in yield. On the other hand, a Cu (**110**) crystal showed no change in yield with temp., while a Cu (111) face showed a decrease in yield of 24, 12, and 16% at 2, 5, and 10 kev., resp.
CC 3 (General Physical Chemistry)

L49 ANSWER 24 OF 26 HCA COPYRIGHT 2002 ACS
58:64251 Original Reference No. 58:10949f-h,10950a Channeling of energetic atoms in crystal lattices. Robinson, Mark T.; Oen, O. S. (Oak Ridge Natl. Lab., Oak Ridge, TN). Appl. Phys. Letters, 2(No. 2), 30-2 (Unavailable) 1963.
AB A strongly penetrating component is evident as an exponential tail in the distribution of particles stopped in the **target** when a solid is **bombarded** by ions of moderate energy. The half-thickness of the tail increases with the energy of the **bombarding** ions. Computer studies are extended to a model with atoms correctly located on lattice sites. The moving particle loses its energy in binary elastic **collisions** with the noninteracting lattice atoms. The slowing down of 1-10-k.e.v. Cu atoms in Cu was calcd. by means of the Bohr exponentially screened Coulomb potential or the Born-Mayer potential II (Gibson, et al., CA 55, 5174c). About 1% of 10-k.e.v. Cu atoms starting from lattice sites and slowing down (Bohr) made very long flights, mostly in .ltbbrac.**110**.rtbbrac. directions. These channeled particles did not move in force-free regions, but had many glancing **collisions** with lattice atoms. The Born-Mayer potential was more realistic in the range studied. Integral penetration distribution plotted for 5-k.e.v. Cu atoms normally incident on the principal planes of Cu closely resemble exptl. curves, including inflection points and exponential tails. The half-thickness of the exponential tail increases linearly with initial energy, as do exptl. tails. The mean penetration of the incident ions is dependent on their initial direction of motion. The differential distribution curves are bimodal. Both exptl. range data and monocryst. **sputtering** yield data indicate the phys. reality of the channeling mechanism. Channeling is not restricted

to **face-centered-cubic** crystals.
Preliminary calcns. for diamond and body-centered-cubic structures also show extensive channeling. The existence of channeling may have significant implications for radiation damage theory, since channeled particles lose energy in small increments and produce fewer displacements than expected from the cascade theory.

CC 13 (Nuclear Technology)

L49 ANSWER 25 OF 26 HCA COPYRIGHT 2002 ACS

51:60250 Original Reference No. 51:11043h-i,11044a-b Deposit spot patterns from low-index planes of metal single crystals in a new theory of cathode **sputtering**. Henschke, Erich B. (Wright Air Develop. Center, Dayton, O.). J. Appl. Phys., 28, 411-20 (Unavailable) 1957.

AB The generation of the deposit spot patterns from low-index planes at lower and higher ion energy is explained by mech. double and triple **collisions** of the perpendicularly incident ions with lower and upper surface atoms of the **target** plane. The effective **collision** spheres are assumed to be detd. by the largest closed electronic shells of the ion and the **target** atom with radii smaller than the radii of the largest electronic orbits of these shells. A 2nd factor that has to be taken into account for the explanation of the shape and other features of the single spots of the patterns is the attenuating influence of the different electron ds. in the paths of the ion within the lattice, because the largest closed electronic shells exceed the size of the **collision** spheres and produce the highest electron d. in close-packed rows of the lattice. These 2 concepts are sufficient to explain the no. and arrangements of the spots in the patterns of low-index planes, the specific shape of the single spots, the alterations of the spot patterns connected with higher ion energy or with accidental deviations of the prepd. crystal plane from the ideal crystallographic plane, the deviation of the symmetry axis of the single spots in (**110**) **face-centered-cubic** patterns from the diagonal direction of the unit area, and finally the different shape and size of the single spots in (111) spot patterns of Ag and Cu.

CC 3 (Electronic Phenomena and Spectra)

L49 ANSWER 26 OF 26 HCA COPYRIGHT 2002 ACS

50:68036 Original Reference No. 50:12634c-h Controlled **sputtering** of metals by low-energy Hg ions. Wehner, Gottfried K. (Wright-Patterson Air Force Base, O.). Phys. Rev., 102, 690-704 (Unavailable) 1956.

AB **Sputtering** was studied at 1 .mu. pressure, at energies up to 300 e.v., and at various angles of incidence, with an ion current d. of 10 ma./sq. cm., by immersing the **target** in a low-pressure Hg plasma of high d. created in a pool-type vacuum arc. Threshold energies are considerably lower under oblique than under normal incidence, and the atoms are ejected away from the direction of incidence. Thresholds at normal incidence of Hg ions are, in e.v.: Al, 120-140; Si, 60-70; Ti, **110**-130; V, 120-130; Cr,

60-80; Fe, 60-70; Co, 80-100; Ni, 70-90; Cu, 50-70; Ge, 40-50; Zr, 120-130; Nb, 120-130; Mo, 80-100; Rh, 70-80; Pd, 50-80; Ag, 40-50; Sb, 30-40; Hf, 150-180; Ta, 120-140; W, 80-100; Re, 70-80; Pt, 70-90; Au, 40-50; Pb, 20-40; Th, 120-140; U, 70-80. The predicted threshold energies for these elements are tabulated for He, Ne, A, Kr, Xe, and Hg ions. The exptl. thresholds follow, without exception, a simple law. The product of the momentum transferred at threshold from ion to **target** surface atom and the sound velocity of the **target** material is proportional to the heat of sublimation of the **target** material. The yield (atoms per ion) vs. ion energy was carefully measured for the case of polycryst. Pt. When metal single crystals were **sputtered** , atoms were preferentially ejected in the directions of closest packing, that is [110] in **face-centered cubic**, [111] in body-centered cubic and diamond lattices. Deposits **sputtered** from plane low-index surfaces of single crystals therefore form characteristic patterns. Their study reveals more details: at low ion energy, only atoms are **sputtered** which have no obstructing neighbors in the way of a close-packed direction. At higher ion energy, addnl. atoms are set free from positions where neighbor atoms interfere. Such atoms deviate in a characteristic way from the directions of close packing. Most atoms **sputtered** in close-packed directions which are parallel to the surface are trapped again, causing growth of oriented hillocks. The possibility for crystal growth by **sputtering** was demonstrated in another expt. Some characteristic features of the etch effects caused by **sputtering** are described. The basic process in **sputtering** at low ion energies is one of momentum transfer. The important parameters with respect to the gas discharge are ion energy, angle of incidence, and at. wt. of ion; on the **target** side they are the at. wt., the elastic consts., crystal structure and orientation, the heat of sublimation, dislocations, and surface roughness.

CC 3 (Electronic Phenomena and Spectra)

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=> d his l50-

     (FILE 'HCA' ENTERED AT 18:05:13 ON 12 MAR 2002)
L50            192 S L2(3A)L28
L51              5 S L50 AND (L3 OR L4)
L52              5 S L51 NOT (L42 OR L43 OR L44 OR L49)

=> d l52 1-5 cbib abs hitind
```

L52 ANSWER 1 OF 5 HCA

125:21618 Grain destruction in the shell of Nova Aql 1993. Smentkovskii, A. V.; Yudin, B. F. (Gos. Astron. Inst., Moscow, Russia). Pis'ma Astron. Zh., 22(3), 193-197 (Russian) 1996. CODEN:

PAZHDA. ISSN: 0320-0108.

AB Calcns. of models for the dust shell of Nova Aql 1993 showed that the period of its isothermal expansion, i.e., the period during which the shape of the energy distribution in its spectrum remains unchanged, is related to perceptible destruction of dust particles. In order for the computed light curves to coincide with the obsd. ones, the destruction of grains must be complex in nature, incorporating their fragmentation, in which the total mass of the dust shell is preserved, and destruction as a result of bombardment of their surface by particles of the gaseous phase (**sputtering**), in which the **grain size**, i.e., their total mass, decreases, but their total no. is preserved. It seems quite reasonable to suppose that both these processes proceed.cntdot.simultaneously in clumpy nova shells with a large scatter of internal velocities. Within .apprx.**110** days after the condensation, the originally optically thick (yv .simeq. 2.5) dust shell of Nova Aql 1993 becomes essentially transparent (tv .simeq. 0.04). By this time, the destruction of grains had led to a .apprx. 25-fold increase in their no. and .apprx.7-fold decrease in their total mass. The grain size is reduced by a factor .ltoreq.6. During the expansion of an optically thick dust shell, the partial stabilization of its solar properties may be caused by optical effects arising from a decrease in its opacity, with the grain temp. at its inner boundary actually decreasing.

CC 73-9 (Optical, Electron, and Mass Spectroscopy and Other Related Properties)

L52 ANSWER 2 OF 5 HCA COPYRIGHT 2002 ACS

123:120174 Comparison of mechanical properties and microstructure of Al(1 wt.%Si) and Al(1 wt.%Si, 0.5 wt.%Cu) thin films. Bader, S.; Kalaugher, E. M.; Arzt, E. (Max-Planck-Institut fuer Metallforschung and Institut fuer Metallkunde, University of Stuttgart, Seestr. 92, Stuttgart, 70174, Germany). Thin Solid Films, 263(2), 175-84 (English) 1995. CODEN: THSFAP. ISSN: 0040-6090.

AB The microstructures and mech. properties of hot and cold sputtered Al-1 wt.%Si and Al-1 wt.%Si-0.5 wt.%Cu films were studied. Transmission and scanning electron microscopies were used to examine the grain size, ppt. morphol. and surface structure of the films. Stress measurements using a substrate curvature technique and hardness measurements made by nanoindentation were employed to study the mech. properties. The cold sputtered films show a smaller **grain size** than the hot **sputtered** films before and after annealing, whereas the ppt. morphol. looked the same after annealing for both films. Stress/temp. curves of AlSi and AlSiCu films are very similar on heating and on cooling above **220**.degree.C. However, below this temp. the tensile stresses in the AlSiCu films increase sharply with decreasing temp. compared with the AlSi films. This effect is normally attributed to pptn. hardening of Al2Cu ppts. which form below 250.degree.C. However, there is evidence for a second explanation. The steep rise in stress can be caused by the end of diffusional relaxation. Calcns. show that the breakdown of thermal activation of diffusional

processes occurs in the same temp. range.
CC 56-12 (Nonferrous Metals and Alloys)

L52 ANSWER 3 OF 5 HCA COPYRIGHT 2002 ACS
111:207777 Coercive forces and magnetostriction of iron-carbon films deposited on zinc oxide substrates. Sakai, R.; Shimada, Y. (Res. Inst. Sci. Meas., Tohoku Univ., Sendai, 980, Japan). Phys. Status Solidi A, 113(1), K131-K134 (English) 1989. CODEN: PSSABA. ISSN: 0031-8965.
AB The coercivity and magnetostriction were studied of Fe-C films sputter deposited on ZnO (**110**) substrates. Films with .ltoreq.10 at.% C are single phase with well oriented (**110**) planes. The grain size is nearly independent of the C content at 0-22 at.% C. The magnetostriction and coercivity increase to satn. levels as the C content increases. The effect of a 400.degree. anneal is described on a Fe-8 at.% C film.
CC 77-1 (Magnetic Phenomena)
Section cross-reference(s): 55
ST coercivity magnetic iron carbon sputtered film; magnetostriction iron carbon sputtered film; **grain size** iron carbon **sputtered** film; annealing iron carbon sputtered film

L52 ANSWER 4 OF 5 HCA COPYRIGHT 2002 ACS
111:26797 Localized corrosion of microcrystals of 1Cr18Ni9Ti stainless steel. Liu, Dacheng; Cao, Chunan; Wang, Fuhui; Lou, Hanyi; Zhang, Lixin (Inst. Corros. Prot. Met., Acad. Sin., Shenyang, Peop. Rep. China). Jinshu Xuebao, 24(5), B369--B371 (Chinese) 1988. CODEN: CHSPA4. ISSN: 0412-1961.
AB The resistance to localized corrosion of 1Cr18Ni9Ti microcrystals with a normal grain size and bcc. structure obtained by magnetron sputtering was investigated. Two kinds of microcrystals with a (**110**) or (211) texture were obtained under different sputtering conditions. Both microcrystals had a higher resistance to localized corrosion than that of crystals with a normal grain size. The microcrystals with a (**110**) preferred orientation had a higher resistance to localized corrosion than that with a (211) preferred orientation.
CC 55-10 (Ferrous Metals and Alloys)
IT 54611-20-0
(corrosion of **sputtered**, **grain size** effect on localized)

L52 ANSWER 5 OF 5 HCA COPYRIGHT 2002 ACS
83:156777 Silver sulfide iodide (Ag3SI) solid electrolyte film. Suzuki, Yoshihiro; Asai, Osamu (Hitachi, Ltd., Japan). Japan. Kokai JP 50080996 19750701 Showa, 3 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1973-130210 19731121.
AB Ag films of small **particles sizes** prepd. by **sputtering** onto a rough surface of a substrate are treated with vapors of S and I. Thus, a Ag film of particle size a 20-50 nm on a hard glass plate was treated at **220**.degree. with Ar

30 ml/min satd. with S at 140.degree. and then with I at room temp. for 1 hr, and heated at 450.degree. for 3 hr in an Ar stream.

IC C01G; H01B; H01M

CC 76-2 (Electric Phenomena)